INDIAN FOOD INDUSTRY

VOLUME 14
6/1995
NOVEMBER/
DECEMBER

A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)

MUSHROOMS

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Quality in Food Sector

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA) MYSORE - 570 013

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* Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
* The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
* The chapters of the Association the association are located at Bangalore, Bhopal, Bombay, Calcutta, Delhi, Hisar, Hyderabad, Jabalpur, Jaipur, Jammu, Kanpur, Karnal, Kharagpur, Ludhiana, Madras, Manipur, Nagpur, Pantnagar, Parbhani, Pune and Thiruvananthapuram.

Objectives :

* Advancement of all the aspects of Science and Technology relating to production, processing and distribution of food, with the ultimate objective to serve humanity through better food.
* Promotion of research, development and training in the Science, Technology and Engineering of Food.
* To provide a forum for exchange, discussion and dissemination of knowledge and current developments, especially among Food Scientists and Technologists as well as the Public and Society at large.

Major activities :

* Publication of 'Journal of Food Science and Technology' (bi- monthly) and 'Indian Food Industry' (bi-monthly),
* Holding symposia/conventions on different aspects of Food Science, Technology and Engineering
* Arranging Lectures and Seminars for the benefit of Members and the Public.

Membership :

* Membership is open to graduates and diploma holders in Food Science, Technology and Engineering as well as to those engaged in these professional activities.
* Types of membership include Life Member, Life Member (Resident Abroad), Corporate Members, Full Member, Member (Resident Abroad), Affiliate Member, Student Member and Student Member (Abroad).
* Each member will receive a free copy of the 'Journal of Food Science and Technology' or 'Indian Food Industry,' as per the option exercised.

For Membership, Subscription to the Journals and other particulars, kindly contact :

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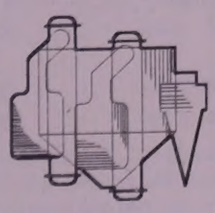

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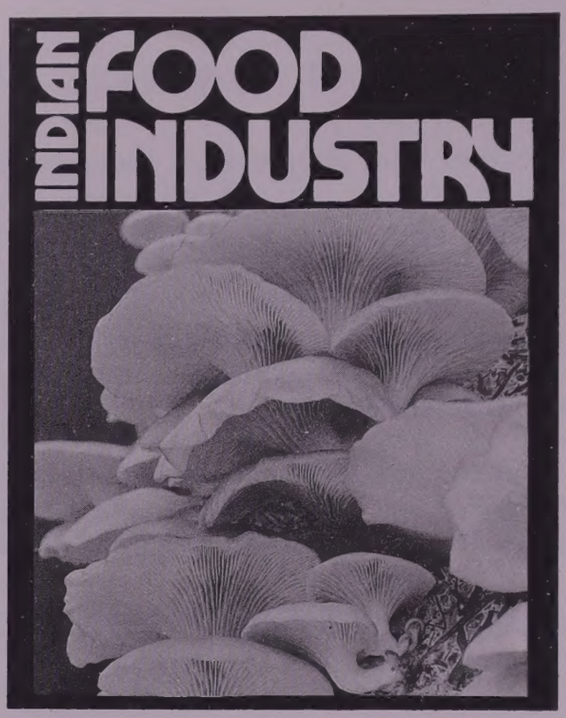

Cover :
Oyster Mushrooms

Photographed by
M. Vishnu Kumar

Indian Food Industry (ISSN-0253-5025) is a bi-monthly publication of the **Association of Food Scientists and Technologists (India),** devoted to give extensive coverage to technological and market developments relevant to food industries in India.

Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal.

Food industries may send information (suitably illustrated with photographs) about their new products, machinery, business ventures and other developments, which will be published on the discretion of the Editorial Board.

Subscription : All members of AFST(I) are entitled to receive the **Indian Food Industry** journal regularly free of cost, if they opt for it. Members who are receiving **Journal of Food Science and Technology** and desirous of changing over to **Indian Food Industry,** can do so by sending a formal request to the Executive Secretary, AFST(I). Alternatively, they can subscribe to **Indian Food Industry** by paying an additional amount of Rs 50. The regular subscription rates for the journal are as follows :

	Valid till 1995		
	1 Year	2 Years	3 Years
Inland	Rs 180	Rs 340	Rs 510
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Printed and published by the Executive Secretary, Association of Food Scientists and Technologists (India) at the Bangalore Press, Bangalore - 560 018. Views expressed in the columns of the Indian Food Industry are not necessarily those of AFST(I).

Correspondence : All correspondence related to editorial matters, subscriptions and advertising should be addressed to

The Chief Editor, Indian Food Industry,
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CONTENTS

NOVEMBER-DECEMBER 1995

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EDITORIAL

For the Food Industry in India, the year was one of challenges and performances. A good number of investments have come in and new projects commissioned.The year also saw a few corporate wars being waged against established norms and practices, fair or unfair they be. To the food professionals, these portend a turn-about and the recognition of food technology and food science not as an art or a compendium of empirical experience, but a hard science of multidisciplinary dimensions. The array of newer products, new environment of their marketing, new palates and new consumers all give new challenges to the professional minds in Food Science and Technology.

It is predicted that there are likely to be fundamental changes in the content and legal framework in the administration of the food laws of India, which many in the Industry believe, need recasting lock, stock and barrell. While efforts are in progress in different quarters, the professionals in Food Industry also need to put in their efforts to air their views. May be, IFI can be a conduit to convey the deficiency to the right forums and provide its views. IFI invite suggestions from the Industry.

The AFST(I) and the Journal of Indian Food Industry wish all readers and patrons a Happy New Year 1996.

S.P. Pillai
Chief Editor

INDUSTRY NEWS

Ushering in a New Era for Patenting

India is seeking international help for a strong infrastructure in patenting and several countries including the US, Britain, Germany and Singapore have been identified for their expertise in the field according to Dr. R. A. Mashelkar, Director-General of the Council of Scientific and Industrial Research (CSIR).

The DGCSIR said that more than 2,000 patents were registered annually in India and CSIR is now seeking help in international patenting.

Patenting should be guided by three features, viz., novelty, non-obviousness, i.e. through human intervention and creativity, and utility.

He was in Singapore, attending a seminar on technological opportunities in India organized by the Singapore National Science and Technology Board the and CSIR. The seminar was a follow up of an agreement in Science Co-operation signed by our Prime Minister and the Prime Minister of Singapore.

Today, intellectual prowess is unleashed in India because of the new strategies taken by the US, the incentives provided and also due to fierce world competition.

In voicing his support for public funding of science and R & D, he felt that if the work was directly useful to the industry then it should be funded by them. He added that basic research should be funded by the Government especially in areas where there was a question of social obligation.

Earlier he told an international gathering of scientists that the major advantages of having an R & D alliance with India were the low cost of research and high quality science base in select areas, as well as the better communications offered by Indian R & D institutes operating in the post-liberalization era. The pavilions put up by the CSIR, CMC and C-DAC pavilions at Technology Showcase '95 attracted wide interest.

Aqua Culture in the East-coast Earns a NEERI Censure

The average annual damage due to unscientific aquaculture in Andhra Pradesh is put at Rs. 6,305 crores against an earning of Rs. 1,498 crores from the industry as per a NEERI report.

In Tamil Nadu , the damage has been estimated at Rs. 423 crores against an annual earning of Rs. 280 crores. These estimates have been prepared after taking into consideration loss of wages, loss of mandays, loss of agricultural produce, fuel and grazing from coastal lands converted into aquafarms, loss of fishing income, potable water, desertification, etc. These are in addition to the one-time permanent damage due to loss of land estimated at Rs. 105.73 crores in Andhara Pradesh and Rs. 18 crores in Tamil Nadu.

The report states that the law enacted by the Tamil Nadu Government on April 10, 1995, to regulate coastal aquaculture is violative of the Ministry of Environment and Forests' (MoEF) notification of February 19, 1991. The report is the result of an investigation conducted by NEERI for the Supreme Court to study the "impact of aquaculture farming and remedial measures in ecologically-fragile coastal areas" in the States of Tamil Nadu and Andhra Pradesh and the Union territory of Pondicherry. The report eventually led to suspension of further coast land for aquaculture farm.

The damage caused to land and water ecosystems by coastal activity, as detailed in the report, must be restored to its original ecological state. The cost of eco-restoration of the coastal fragile area must be borne by individual entrepreneurs of coastal aquafarms in keeping with the 'polluter pays" principle.

It states that "the cost of ecological and social damage far exceeds the benefits that arise out of coastal activities" and that no activity of commercial coastal aquaculture should be undertaken even beyond 500 metres from HTL, unless a comprehensive and scientific EIA study has been conducted by the entrepreneur, and the environment management plan approved by the respective State environment department, the Pollution Control Board, the Shore Development Authority and the MoEF.

The report, based on a visit to 46 farms in Andhra Pradesh, 103 farms in Tamil Nadu and 20 in Pondicherry by

a team of scientists headed by Dr. A. S. Bal and Dr.S. N. Kaul, has said ' "Coastal aquaculture has resulted in loss of mangrove ecosystems which provide protection against cyclone and other natural hazards. Indiscriminate destruction of mangroves has resulted in loss of natural breeding grounds for shrimp. Unscientific management practices of aquaculture farms leading to inadequate drainage systems have resulted in skin, eye and waterborne diseases. Commercial aquafarms have not contributed to any social infrastructure facilities for the villagers."

It also states that the employment level has declined and that there has been encroachment on Government and agricultural lands and salt farms.

NEERI has recommended that licences for fresh aquaculture farms be issued only after an EIA has been made that no salt lands be converted fro aquaculture, no ground water be tapped by farms and that they should adhere to "coastal regulation zone" guidelines. It suggested an "Eco-restoration Fund" to which one per cent of the export earnings should be contributed by the exporting units. Fishermen should be allowed access to the sea through aquaculture units and co-operative shrimp farming should be encouraged.

The noted environmentalist-lawyer, Mr. M. C. Mehta, said that the Tamil Nadu legislation on aquaculture was violative not only of MoEF guidelines, but also of Article 21 (right to life) and Article 51 AG of the Constitution, the Environment Protection Act, 1986, the Environmental Guidelines on Development of Beaches, July 1993, the Prime Minister's directive of November 1991 to coastal States, and the Water Act.

He also alleged that other States in the country were not making an attempt to draw up guidelines for coastal management even after 14 years of the Centre's directive in connivance with corporates engaged in aquaculture.

Cashew Kernel Exports Touch Record High

Cashew kernel exports from India reached 73.25 per cent of the world market in 1994-95 despite constraints such as a fall in domestic production and Vietnam reducing its exports to India.

Whether this figure can be sustained in October to March will depend on world supplies, especially from Brazil.

However, even that shortfall will be temporary in the all-round growth of the industry, according to farmers, scientists and exporters in Mangalore and Puttur.

'In the 1940s, India had almost 90 per cent of the cashew kernel market," the Dakshina Kannada Chamber of Commerce President, Mr. A. K. Gopinath Shenoy, said. "Since then our share had been slipping and at one stage, came down to less than 50 per cent. However, in the last three years, there has been a consistent growth and by March -end 1995, we reached 3.450 million cartons worth Rs. 1,250.79 crores, a record high."

The proprietor of Achal Industries, Mr. G. Giridhar Prabhu, said the trend would continue because of the awareness among trade, industry, farmers and the Government.

The fall in production from 305,000 tonnes last year to 255,000 tonnes was a climatic aberration, he said, adding farmers were enthusiastic and the crop acreage ad been increasing in the States concerned. According to the plans of Government agencies, cashew production will double from the current average figure to 600,000 tonnes in four years.

India would remain a world leader despite the anticipated competition from Vietnam. "We will not account for less than 50 per cent even when others arrive in the export market," the Kalbavi Cashews Managing Partner, Mr. K. Prakash Rao, said.

'Our exporters have a presence in 50 countries and an excellent network in major consuming countries such as the US, the EEC and Japan. West Asia is another good market," Mr. Prabhu said.

Japan - an Expanding Market for Spices

Japan is one of the major importers of spices among the developed countries. Domestic production of spices, including those spices, which have been an integral part of the Japanese diet for many centuries, is very low. It is estimated that over 95 percent of all spices consumed in Japan are imported. In recent years, the volume of spices imported into Japan is showing an increasing trend. Almost all the spices imported into Japan are domestically consumed and the volume of species exported is negligible.

Import of Spices into Japan

The average import of spices into Japan (for 1992 & 1993) is around 83,000 MT mainly consisting of ginger, capsicum, pepper, turmeric and coriander in the order of importance. Ginger is the single largest spice

imported into Japan which accounts for nearly 65 per cent of total spices imported. The average import of ginger is around 53,600 MT in the form of ginger preserve, ginger whole and ginger crushed. In fact, Japan is the world's single largest market for ginger preserve.

Imports during 1994

During 1994, the import of spices into Japan has risen to 86,249 MT compared to the average import of 82,980 MT during 1992 & 1993. The major commodities imported during 1994 are ginger (53,915 MT) in the form of preserve (24,598 MT), whole (28,189) and crushed (1,128), capsicum (10,626) in the form of both whole and ground, pepper (6178), turmeric (3295) and seed spices. The major suppliers during 1994 are China, Indonesia, Malaysia, Thailand and Taiwan. China is the largest supplier of spices to Japan with a market share of more than 50 per cent (in quantity terms) during 1994.

Export of Spices from India

The average export of spices from India to Japan for the last five years is around 6500 MT valued around Rs. 175 million accounting for about five per cent both in terms of quantity and value of total exports from India. The major commodities being exported from India are cardamom, turmeric, spices oils & oleoresins, pepper and seed spices. As far as cardamom is concerned, Japan is a very important market for India, accounting for 57 per cent in quantity and 55 per cent in value.

During 1994-95, India exported 7063 MT spices valued at Rs. 301 million which is 4.6 per cent and 26 per cent higher in quantity and value respectively compared to imports in 1993-94. The major spices exported during 1994-95 are turmeric (2115 MT), fenugreek (1046 MT), cumin (410 MT), cardamom (146 MT), spice oils & oleoresins including mint oil (287 MT) and other miscellaneous spices (1819 MT).

Market Characteristics & Future Outlook

Market Characteristics

Of the total consumption of spices, and estimated 75 per cent are used by the food industry, 10 per cent by the food service industry and 15 per cent are house hold consumption.

The spice market of Japan is said to be still in an early stage of development and compared to Europe and the US, consumption is relatively low. The Japanese consumer, as per JETRO, uses just 60 gms of pepper per year in contrast to 150-180 gms per head in Europe and the US. The Japanese diet is the main reason for the comparatively low level of spice consumption. Traditionally Japanese consumers accompany their food with condiments and seasoning made from fermented bean products such as miso and soy sauce. In addition, fish plays a major role in the daily Japanese diet, so the most widely consumed spices are those that complement fish dishes such as ginger, Japanese pepper, Japanese horseradish and garlic.

Quality

The quarantine regulations and epidemic prevention laws are designed to prevent blight and vermin entering the country. The plant quarantine procedure is conducted mainly for the detection of live insects. If live insects are found, either in the products or the packing materials, the products are fumigated for 48 hours in hermetically sealed warehouses, and then re- inspected. If the insecticidal process has been successful, an inspection certificate is issued. If not, the products will be subject to disposal or some times reshipment.

Japan's Food Sanitation Law restricts the use of additives and spices must undergo strict inspections to detect aflatoxin. If the aflatoxin content exceeds the upper limit of tolerance, the goods are subject to reshipment or disposal and Japanese importers generally include reshipment clauses in import agreements. Moreover, food importers and food processing companies follow their own voluntary guidelines that require virtually no presence of aflatoxin.

The tolerance limit prescribed for various contaminants under the law are : Aflatoxin - 10 ppb, Radioactivity - 370 BQ - Sulphur dioxide-30 ppm

The stringent guidelines set by Japan's food industry means that although radioactive contamination of 200 BQ is well below the stipulated standard, most of the food industry would be reluctant to use a product with this content.

The heat/steam sterilization system is the approved method for the reduction of bacteria in foodstuffs. The use of radioactive rays or ethylene oxide gas, although approved in other countries, are not acceptable as food sterilizing methods in Japan.

Japanese importer may ask the exporter to attach the following certificate :

- Certificate of origin
- Certificate of origin under GSP
- Form - A
- Phytosanitary certificate
- Radio activity certificate

Under Japanese regulations, importers are obliged to subject all imported foodstuffs to inspection at the port of unloading, whether or not the exporter has attached the certificates.

Future Outlook

In recent years, the internationalization of Japan has made its mark on the food consumed daily and curry rice, a seasoned dish prepared with blend of spices is becoming a household staple. Curry rice has spurred demand for spices in Japan and approximately 40-50 per cent of spice consumption by food is for various curry rice dishes. There is particularly good demand for spices in the production of instant curry products. Further diversification of Japanese eating habits is expected to expand demand in future, in terms of both varieties and volume.

According to Japanese importers, the most effective way for exporters to further increase demand for spices in Japan is to educate consumers about the spice qualities and uses. This may expect to spur the demand for spices as well as spice blends.

Brand Registration for Institutional Packs

The Spices Board is extending the facility of Brand Name registration for institutional packs also (i.e. upto 25 kgs. packs) so as to enable exporters to qualify for the quality logo of the Spices Board.

The Board is amending the Spices Board (Quality Marking) Regulation, 1992 to include institutional pack upto 25 kgs. under the quality logo in the place of one kg. consumer packs. This is to facilitate the exporters to avail of the quality logo of the Spices Board for large packs also and to avail the brand promotion loan scheme. Specifications of material for the institutional packs have been drawn up in consultation with Indian Institute of Packaging. Interested parties may register the brand of their institutional pack, by submitting an application as was done in the case of registration form and specification/norms of material for the institutional pack, please write to Director (Marketing) Spices Board, Cochin - 25.

Poland - Export Prospects for Developing Countries

Agro-based products

Approximately one quarter of Poland's imports from developing countries are agro-based products. The major items are bananas, coffee, tea, rice, cocoa beans, oilcakes and tobacco. Other significant purchases in this category are spices, fish, coconuts, grapes, corn, peanuts, palm oil, chocolate, cocoa paste and butter, preserved fruits, coffee and tea concentrates, and wine. Some agricultural products come exclusively from developing countries (for instance coconuts and peanuts).

Bananas : In 1992, Poland imported 171,700 tonnes of bananas from developing countries, valued at $65 million. Consumption of this fruit has been relatively high in recent years and continues to grow. The largest supplier is Ecuador, followed by Colombia and Costa Rica. Smaller quantities come from Mexico, Honduras, Nicaragua and Panama.

Coffee : Coffee intake has been growing rapidly. Poland purchased 68,500 tonnes of coffee from developing countries in 1992, at a value of about $60 million. The largest source among developing countries was Indonesia, with supplies amounting to $15 million. Much smaller quantities came from Madagascar ($9 million) and Coted'Ivoire ($8 million). This commodity was also purchased from Vietnam, Thailand, India and Sierra Leone, and more limited volumes from the Lao People's Democratic Republic, Zimbabwe, Ecuador, Colombia, Cameroon and Brazil.

Tea : Poland is a major importer of tea, although coffee is increasingly preferred to tea. In 1992, tea purchased from developing countries registered 21,800 tonnes, worth $35 million, compared with only 12,000 tonnes in 1990. India, the largest supplier, provided $22.5 million worth in 1992. Other major sources were China, Bangla Desh and Sri Lanka. Chile, Kenya and Indonesia sold small quantities to this market.

Rice : In 1992, Poland bought over 35,000 tonnes of rice from developing counties, at $12 million. Pakistan and Thailand were the only suppliers among developing countries that year. The largest source was China, providing nearly $10 million worth.

Cocoa beans : Poland bought 30,00 tonnes of cocoa beans in 1992, totalling $37 million, from developing countries. The main source was Cote d'love, with its imports at over $24 million. Smaller amounts were purchased from Nigeria and Togo ($7 million and $5 million. respectively). Imports of cocoa beans have been growing significantly after a severe drop in the mid-1980s.

Oilcakes : Over 495,000 tonnes of oilcakes were purchased by the country in 1992, a rise over 1990. About 175,600 tons, at $39 million, came from developing countries in 1992, in particular from Argentina, Brazil and Paraguay.

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Raw materials

Basic materials other than fuels account for 7% of all Polish imports from developing countries. The major items are phosphates, iron ore and rubber. Other imports in this category are magnesite, magnesia and manganese ore. In 1992, these commodities were obtained primarily from Brazil. Smaller amounts of magnesite were imported from China, and manganese from Gabon.

Developing countries also supplied other raw materials, for example cotton, from Turkey, and jute, from Bangla Desh. The main cotton exporters to the Polish market continued, however, to be the former USSR republics.

Phosphates : In 1992, Poland imported almost one million tonnes of natural calcium phosphates, aluminum-calcium phosphates, and phosphate chalk from developing countries, worth $43 million. The largest phosphate suppliers were Morocco ($19 million) and Tunisia ($15 million). Smaller amounts came from Jordan, Algeria and Togo.

Iron ore : Poland purchased 322,500 tonnes ($11 million worth) of iron ore from developing counties in 1992. The only source among developing countries that year was Brazil, while in 1991 a significant volume came from Venezuela.

Rubber : Imports or rubber and natural resins in various forms from developing countries came to almost 20,000 tonnes ($18 million) in 1992. The largest source that year was Thailand with $8 million, followed by Sri Lanka at nearly $4 million. More limited quantities were obtained from Indonesia and Malaysia, and some was imported from Singapore, Cameroon, Nigeria and Ghana.

A New Bio-technological Research Centre to Emerge at Sarnath

A Bio-technological Research and Development Centre will be set up at Mawaiya near Sarnath soon. Spread in an area of about two acres, the first phase of the infrastructure is nearing completion, according to its founder, P.M. Dey, who is currently serving as a faculty member of London University.

The centre will be run as a non-profit making institution and is aimed at introducing modern agriculture related technique to the small scale rural sector.

"The purpose of this centre is also to transfer modern scientific known-how to our people. The centre will be provided equipment worth Rs 10 lakhs by the U.K.

The objective of the research centre, was propagation of elite plants, mainly for horticultural purposes.

Plant tissue culture, food technology, fermentation-based proteins, enzyme technology, applied microbiology, the use of stable and temperature resistant microbes for sewage treatment of waste disposal and conversion of cellulose waste from plant sources into useful energy are some of the aims of the centre. Besides, it will also concentrate on the development of new methods for identifying and detecting harmful microbes which cause food poisoning.

Mr. Dey, hoped that the advancing technology in India especially educating the rural masses, will help in upgrading our living standards.

New Plans of ICAR

The Indian Council of Agricultural Research (ICAR) will soon establish 500 new centres to develop suitable technology for transfer to villages according to their socio-economic status and land holding, according to ICAR Deputy Director-General.

He said that 42 such centres had been selected under this pilot project to boost crop production.

Presently, 25 districts are producing about half of the total foodgrains and 75 districts out of 537 district are producing about two-thirds of the total foodgrain production.

This project was different from the old transfer of technology and would definitely change the scenario of crop production and farm management.

Product Scene-Abroad / India

Specially Formulated Dietary Supplements

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For details, contact Scott Goldsmith, President, Vita Plus Industries, Inc, Dept CN, 953 East Sahara Ave, Ste 21-B 1, Las

Vegas, Nevada 89104 USA. Tel : 702-733-8805, Fax : 702-369-8597.

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The "Ultra Pura' line of point-of-use water filters combines granular activated carbon with an international patented media called NF-85. It removes toxic contaminants such as heavy metals, as well as organic and inorganic chemicals, bad tastes, and odours. The filters are bacteriostatic to prevent growth of bacteria in the unit and provide up to 40, 450 litres of good-tasting water.

For details, contact Edward E Chavez, President, Anaheim Marketing International, Dept, CN, 4332 East La Palma Ave, Anaheim, California 92807 USA. Tel : 714-993-1707, Fax : 714-993-1930.

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For further details contact :
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New Delhi - 110 024
Fax : (011) 4625956, 4623317

Designer Cartons

The bag-in-box system for tea designed by ITC Limited consists of a preformed vacuum filled bag and carton.

Bag construction : Polyster/foil/LLDPE

Box : Six-colour reverse printed polyester film laminated to duplex board.

Tea is filled by weight, vacuumised and heat sealed. Filled and sealed bag is put into the carton with lock bottom. Barrier materials used for pack construction help to preserve product freshness. The pack further admits to fine graphic and is said to be cost effective.

ITC Limited have also designed a carton for Tiffany cookies. The new hexagonal, top bottom lock-in cartons show off graphics, are collapsible and are said to save space and transport costs.

Write for details to :
ITC Limited
Packaging & Printing Division
90, Chamiers Road,
Madras - 600 018
Phone : 4342840/4342871/4347572
Fax : 4340794/4340294
Telex : 23007

A Concerted Action from Mushroom Growers

Mushroom growers in the country, led by a handful of cultivators in Pune, have formed the All-India Mushroom Growers and Exporters Association. The Association will be a platform for collective bargaining in the international market for the protein packed food and for grievance redress with the Government agencies.

The cultivators have drawn up plans to set up the country's first training schools for mushroom cultivation at the cost of Rs. 2 crores for farmers around Pune.

With increasing health-awareness and vegetarianism in the West, the demand for mushrooms, seen as a protein-packed alternative to meat, is increasing at the rate of 10 per cent per annum.

China has failed to make a dent in the global market, mainly due to the failure in producing good quality mushrooms. South Korea and Taiwan have been riddled with increase in prices due to high labour costs.

Of the total mushroom trade, 75 per cent is that of white button mushrooms, while the rest are exotic mushrooms with medicinal value. The association members will now concentrate on large scale production of button mushrooms for the world market.

No Relaxation in Distillery Effluent Treatment Norms

The Government has ruled out any relaxation in the norms for effluent treatment by distilleries and said stricter norms would be enforced from March 31 next.

The decision was taken by the Minister of State for Environment and Forest, Mr. Kamal Nath, after reviewing the present status of effluent standards. The Minister decided that the biochemical oxygen demand (BOD) limit, as notified by the Government in 1988, would

remain unchanged, after reviewing the present status.

The Minister had asked the Indian Agricultural Research Institute (IARI) to carry out experimental studies on the use of the primary treated effluent for ferti-irrigation.

As the research work and experimentation is still going on, units have been permitted up to March 31, 1996 to commission their secondary treatment plants provided they submit a bank guarantee to this effect from the State Pollution Control Board.

SSSIA-CC MoU Signed

It is a good sign that the small industries associations of five Southern States joined together and signed a memorandum of understanding to set up Southern States Small Industries Association Co-ordination Committee (SSSIA-CC) recently at Madras.

The five Southern States have rich potential in connection with small industries development. Each state has strength in certain areas of industries and the absence of effective co-ordination among these states has denied the benefit of the interaction among the industrialists and to learn from each other's experience. The synergy effect of the combination and the rich potential arising out of the linkage are yet to be fully tapped.

Further, it is considered that the presentation of the issues and problems of SSIs of the southern region doesn't carry adequate force when done individually by each State. Keeping all these points in view, the Southern States Small Industries Associations - Co-ordination Committee was formed with mutual consent of the small scale industries associations of Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, and Union Territory of Pondicherry.

This committee will ensure regular exchange of information and better liasion between the Central government and Apex bodies. Also, it will organize regional programmes and represent any problems that emerge out to the Central Government or any other concerned organizations for effective redressal.

It is hoped that the Co-ordinating Committee will be an effective forum for co-ordinating the activities and views of the SSIs of the Southern States for reaping the benefits of the Industries Development.

A Honey Processing Plant in Himachal Pradesh

Himachal Pradesh Agro Industries Corporation is to set up a honey processing plant with a capacity of producing three quintals per day at Kandrori in Kangra district.

Assistance for the project up to Rs. 36.28 lakhs was expected from the National Horticulture Board (MHB). The corporation had projected Rs. 62.80 lakhs for funding by the board for a juice plant at Kandrori. Farmers of the area will be benefitted as their produce like mango, orange, galgal, lime etc., will be processed by the corporation in this plant.

The corporation was finalising a collaboration agreement with Sambholi Sugar Mill, which will set up an agro-based beverage and citrus plant in Kangra district.

The corporation was also setting up a Rs. 3.5 crore floriculture project jointly with Jageribagh Phool Ltd. in Solan district.

Sterling to Diversify into Agro-exports

Sterling Tree Magnum Ltd (STM) with interests in teak, hopes to expand its activities and diversify into the agro-exports business.

The STM president Mr. G. Rajan, told reporters that a separate company would be floated to take up vegetable farming, fruit cultivation and food processing for exports. STM,which is a closely-held company, will approach the public for funding the new project to the extent of Rs. 30-40 crores.

The company, which has over 3,500 acres of plantations, has identified over 4,000 acres more for development in Maharashtra and Andhra Pradesh. It is also considering other species of trees to expand the scope of its plantation activities.

STM's Maharashtra operations will centre around Pune where it has identified over 800 acres of land. Negotiations for the land are being completed.

India in US Export Scene

U S exporters find the Indian consumer an attractive proposition but exploit opinion is that preference is essential to export the Indian market. Right now the quantum of US exports to India in select commodities is as follows :

India's total agricultural imports of $953 million during its 1993/94 fiscal year were dominated by bulk products.

Asian Coffee Limited

100% EoU

(Subsidiary of Tata Tea Limited)

Requires personnel for the following positions based at Secunderabad.

Manager Maintenance -Electrical & Mechanical :

Candidate should be Graduate in Engineering with minimum 10 years experience in Operation and Maintenance of Refrigeration Plant, Generators, Compressors, Water Treatment Plant, Effluent Treatment Plant, in continuous Process Industry. Candidates with experience in Food processing Industry, will be preferred.

Production Superintendent :

Candidate should be an Engineering Graduate/Food Technologist with minimum 6 years experience in a Food Processing Industry with good knowledge in Production. Candidates with experience in Coffee Industry and erection of Food Processing Machinery will be preferred.

Manager-Quality Control :

Incumbent should be a Graduate/Post Graduate in Food Technology with 10 years experience in Quality Control and Quality Assurance for Food Processing Industry. Candidate should be capable of evolving quality standards for raw-materials, process samples, semi-finished and finished products where standard norms are not available. Sound knowledge about various testing equipment used in the labs is essential. The candidate would be required to handle the Quality Control department, independently at plant level.

Lab In-charge and Coffee Taster :

Candidate should be a Graduate in Food Technology with 2/3 years experience or a Science Graduate with 5 years experience, in handling various Testing Equipment and conducting tests in Lab in Coffee Industry with experience in Testing coffee. Knowledge in the statistical Quality Control and design of experiments essential.

Engineer-Projects :

Graduate Engineers with around 5 years experience in selection, ordering and installation of various Plant, Machinery and equipment for continuous process industries with special emphasis on Food Processing Industry. The candidate should preferably have exposure to execution of Projects with knowledge of PERTCPM and evaluation of Projects. Candidates with more years of experience can be considered for senior vacancies also.

Officer-Commerical :

Candidate should be a Graduate preferably with Diploma in Export Sales and procedures with knowledge of Central Excise, Sales Tax, Export Inspection, Documentation procedures, preferably in a 100% Export Oriented Unit. Candidates with 3-5 years experience and knowledge of DTA and exposure to application of computers are preferred.

Assistant Manager-Finance :

Chartered Accountants preferably with ICWA qualification with working experience in Computers, having around 2 years experience in a reputed industry or Firm may apply.

Officer Accounts :

Candidates with M.Com Degree I Class or having completed Intermediate Chartered or Cost Accountancy preferably with 3-5 years experience in a reputed organisation in Accounts/Finance Department can apply. Applicants should be familiar with computers.

Graduate Engineering Trainees :

First Class Engineering Graduates in Chemical or Mechanical or Food processing, from reputed Institutions, preferably with a year's experience in any industry, may apply

Applicants should apply with detailed Bio-data within 10 days to :

The Personnel Manager,

Asian Coffee Limited,

201, Oxford Plaza, 9-1-129/1, S. D. Road,

Secunderabad - 500 003.

Leading imports were items not produced in sufficient quantities in India (pulses, wood and wood products, wool, raw silk and dry fruits) or imported for re-export such as cashews.

India's imports of $119 million from the United States in calendar year 1994 were largely composed of food aid (protein grain products and vegetable oil), almonds and pulses.

Imports of pulses from the United States are primarily green peas shipped in bags or bulk containers and small quantities of dry beans. U.S. pulses accounted for 5 percent of total pulse imports during India's 1993/94 fiscal year.

The United States supplies 80 to 90 percent of India's almond import market as well as small volumes of closed-mouth pistachios for further processing. However, competitive U.S. prices also have spawned some shipments of almonds and pistachios in consumer packs since dried fruit and nuts are among the exceptions to the ban on consumer product imports.

Small volumes of U.S. raisins also have been imported in the past. However, landed prices have been uncompetitive with both domestically produced and imported raisins from other origins. The import duty on raisins is about 73 cents a pound. Imports are experimenting with prune imports from the United States. Once a food additive issue involving potassium sorbate can be resolved, importers are optimistic about sales prospects.

With the recent arrival of several multinationals such as McDonalds, Pizza Hut and Kentucky Fried Chicken in the fast food restaurant and food processing sector, the variety and quantity of consumer food products is expected to increase.

Indian consumers can already purchase potato chips, ketchup, soft drinks, candy bar, breakfast cereals, ice cream, doughnuts, biscuits, frozen meats and vegetables, instant noodles, jams and jellies, packaged grains and pulses and some ready-to-eat frozen meals.

In addition to traditional tastes, there are other social factors which affect food consumption in India. Hindus account for approximately 80 per cent of India's population, and while only a third are strict vegetarians, large numbers of Indians cannot afford to eat meat regularly.

As regards convenience foods, India's lower income households cannot afford them. Middle and upper income households have less of a need for them since many employ household help to do food shopping and the time-consuming preparation of traditional Indian meals.

For U.S. exporters wishing to break into the Indian market, selling input ingredients (such as cheese powders, extracts, flavourings, bases and additives) to India's food processing sector offers a promising avenue for market penetration. However, duties on these products are still high, often 50 per cent, and all imported products are subject to India's stringent food law called the Prevention of Food Adulteration Act.

Small volumes of processed meats, wine, cheese, pasta, cookies and other processed food products enter India under this exception. Total U.S. exports under this exception are estimated to be between $50,000 and $100,000.

Maxworth to Set up Fruit Processing Unit

Maxworth Orchards plans to set up a fruit processing plant at an investment of around Rs. 500 crores to cater to both the domestic and export markets, according to the Chairman, Sterling group (of which Maxworth Orchards is a part).

The company has collaborated with Camtec of Israel and High Value Horticulture of the UK to develop model farms. These collaborators provide know-how from the planning to the marketing stages.

Maxworth has also collaborated with Cross Singapore Pvt. Ltd to set up a project to grow orchids near Madras. The varieties chosen are *Dendrobium* and *Aranda*. The planting material will be imported from Singapore and Thailand. Cross will also assist in exporting these orchids to Japan.

According to Mr. Subramanian, the company's Chairman, a new company called Maxworth Housing would be added to the group. The Sterling group is going to launch a 'national renewal programme'. The nine companies that are part of the group would earmark 2 per cent of their net profit for developing manpower in sports, fine arts and culture.

The company has overcome the problems it encountered while attempting to retail fruits and vegetables and at least 6000 retail outlets would be opened all over the country in the future.

To overcome the problem of fruits and vegetables decaying, the company had custom-designed refrigeration and cold-storage facilities that were not capital-intensive. These would be established at the

farms and retail centres. The vehicles used for transporting the fruits and vegetables would have liquid nitrogen refrigerators.

Scanet Aqua to Set Up Scampy Hatchery

Scanet Aqua Exports Ltd. is setting up scampy hatchery and a tiger shrimp hatchery near Madras. An 18-acre waterspread scampy farm will also be set up in Nellore district.

The company has entered into a technology transfer agreement with JV Marine Enterprise Co. Ltd. of Taiwan to set up the tiger shrimp hatchery.

The hatcheries are being located to facilitate air-lifting of scampy and tiger shrimp seeds to other parts of the country, said the Managing Director, Scanet Aqua Exports.

The project cost is estimated at Rs. 7.05 crores. It will be part financed by a public issue of 20,00,000 equity shares of Rs. 10 each for cash at par of which 10,00,000 shares will be reserved for individual investors not applying for more than 1000 shares.

The company has also entered into an agreement with Fisherton Holdings, Hong Kong, for technical knowhow in live fish exports. It proposes to export 200 tonnes of live fish per annum. It has already begun air-lifting lobsters to Hong Kong.

Fisherton Holdings has agreed to buy the entire supply of live lobster and live fish. A one-year agreement to this effect was signed in May.

Scanet Aqua has also entered into an agreement with ITC for the supply of 500 tonnes of shrimps per annum to feed the ITC processing plant at Calcutta.

Prima Agro Products Finalises Rs. 100 Crore Expansion Projects

Prima Agro Products has finalised plans for an ambitious expansion programme worth Rs. 100 crores. According to Managing Director, these projects will be implemented in the next one to two years.

The group would invest close to Rs. 14.15 crores to set up a solvent extraction and oil refining unit. The unit has the capacity to process the entire range of oilseeds. The unit will produce 300 mt of deoiled cake per day which will be mainly used for captive consumption in the group's own animal feed plant.

The project will have equity participation by Kerala State Industrial Development Corporation (KSIDC) and term lending by IDBI.

The company has been engaged in the manufacture of scientifically formulated animal feed marketed under the brand name Prima Feed. Its consumer products division entered the branded wheat product segment and is marketing the 'Rich Foods' brands of wheat products. The Prima group has already initiated the process of obtaining the ISI 9001 certification.

J.K. Food's Solvent Extraction Plant

J.K. Foods Limited is establishing an edible oil solvent extraction plant in Thirubuvanai village in the Union Territory of Pondicherry. The plant will have a capacity to process 100 tonnes a day of oilseeds and 150 tonnes of oilcakes besides a refinery to process 50 tonnes a day of crude oil.

Vadilal Growth Curve Moving Up

Vadilal Dairy International Ltd. has chalked out a Rs. 150 crore expansion plan for its dairy and ice cream business. According to company spokesperson, the company's ice cream business is growing at a healthy rate of 10 per cent in volume and plans to further launch consolidate its position in the market. Besides hard cheese, cheese triangular chiplets, soft cheese and processed cheese spread. The company will also launch cream cheese, whey powder and low-fat bread spread.

World Bank Scheme for Cattle and Fodder Development Launched

A pilot scheme launched in Tamil Nadu at a cost of Rs. 46.6 crores with the World Bank assistance, has helped double milk production, while ambitious targets have been fixed for egg

and meat production, according to the State Animal Husbandry Director, Milk production is expected to go up to 54.8 lakh tonnes and egg production to 6,000 millions by the year 2000.

The World Bank Scheme primarily aims at cattle and fodder development and it had been supplemented by health care.

The program also envisages increasing the coverage of cattle population for health care to 70 per cent from the present 30 per cent. He claimed that Tamil Nadu was the only State where frozen semen technology was in use. At present, there are 3,500 artificial insemination centres in the State and another 300 centres would be opened.

The per capital consumption of milk in the State has gone up to 169 gms from a low 101 gms and it is expected to be 220 gms by 2000 AD.

Indian Brands Taken Over

The takeover of Milkfood ice cream by Brooke Bond Lipton India Limited (BBLIL) is another instance of multinational creaming a well known Indian brand. Parle, which had 60 per cent of the aerated soft drinks market has been reduced to the status of being mere bottlers.

Ice cream is reserved for the small sector. The ice cream market is growing fast from the present size of about Rs. 800 crores. To circumvent restrictions and gain the lucrative market, BBLIL has entered into a strategic alliance with Kwality and now Milkfood. This will enable the Unilever group company to control more than 50 per cent of the ice cream market. But this still falls short of the rule of thumb figure of 66 per cent market share, crossing which would invite antimonopoly action in developing countries. Given the smallness of Indian firms, they probably should be allowed to expand, merge and consolidate to take on global competition.

To Our Subscribers

Due to the unprecedented rise in the market prices of newsprint and consequent increase in the cost of production in bringing out the journal '**Indian Food Industry**", the Central Executive Committee of the Association of Food Scientists and Technologists (India) is constrained to take a painful decision to revise the subscription rates of the journal with effect from January 1996 as follows :

1 year	Rs. 300/- (inclusive of registration, Book Post charges)
2 years	Rs. 550/- (inclusive of registration, Book Post charges)
3 years	Rs. 800/- (inclusive of registration, Book Post charges)

We solicit your continued cooperation and support to the journal, as in the previous years.

Chief Editor
on behalf of AFST(I)

Assistance Schemes of Ministry for Food Processing Industries (Continued from previous issue)

Meat & Meat Processing

Name of Scheme (1)	Activity proposed to be assisted (2)	to whom (3)	Pattern of Assistance (4)	Grant-in-aid/ Equity (5)
1. Establishment of National Livestock Products Development Council	Setting up of Council	to the council	i) Lump sum grant	Grant
2. Development of pork processing	a) Setting up modern pork processing plants & providing additional line in existing plants	i) State undertaking	upto 50% of capital cost of project (75%) in NE & ITDP districts)	Equity
		ii) Joint Sector	upto 25% of capital cost in other areas & 37% in NE, ITDP & hill areas of J & K	Equity
		iii) Cooperatives	50% of capital cost	Grant/Equity
		iv) to Coops./district Councils for setting up plants in NE & ITDP districts of J & K & hill areas	67% of capital cost.	Grant/Equity
	b) for strengthening backward linkage with pig rearers	State Govt., Dist. Councils, Undertaking, cooperatives, Jointsector, private sector	5% of total contracted purchase value subject to max. Rs. 5 lakhs p.a. per plant provided plant makes contract with at least 50 rearers for at least 1 year.	Grant
3. Development of sheep goat and rabbit meat processing.	a) Setting up of projects	i) State undertakings	upto 50% of capital cost of project (75% in NE & ITDP districts)	Equity
		ii) Joint sector	upto 25% of capital cost in other areas & 37% in NE, ITDP & hill areas of J&K.	Equity
		iii) Cooperatives	50% of capital cost.	Equity
		iv) Cooperatives/distt. Council	67% of capital cost	Grant/Equity
		iv) for setting up plants in NE, ITDP dists and hill areas of J&K.		
	b) for strengthening backward linkage for sheep & goat rearers	State Govts., Dist. Councils, Undertakings Cooperatives, Joint sector, Private sector	5% of total contracted purchase value subject to max. Rs. 5 lacs p.a. per plant provided plant makes contract with at least 50 rearers for at least 1 year.	Grant
	c) for backward linkage with rabbit growers	-do-	10% of purchase value s.t. max. Rs. 5 lacs p.a. per plant, provided plant makes contract with least 50 rearers for 1 year.	Grant
4. Development of Poultry & egg processing	a) Setting up of projects	as in scheme 2(a)	above	
	b) strengthening backward linkage	as in scheme 2(b)	above	
	c) Setting up of projects	Poultry Plants undertaking on export obligation of at least 25% of the product for at least 5 years.	upto 15% of project	

Meat & Meat Processing

Name of Scheme (1)	Activity proposed to be assisted (2)	to whom (3)	Pattern of Assistance (4)	Grant-in-aid/ Equity (5)
5. Development of Buffalo meat processing	a) Setting up of Buffalo meat plant	i) State Govt. undertaking ii) Joint sector iii) Cooperatives iv) Private entrepreneur/ Association	50% of capital cost 25% of capital cost 50% of capital cost reimbursement of 50% of customs duty	Equity Equity Grant/Equity Grant
	b) Setting up of modern abattoirs with quality control facilities for supplying carcasses	Municipal Corporations	25% of capital cost	Grant
	c) Modernization of existing slaughter houses for Buffalo.	Municipal bodies	50% of cost of modernization	Grant
6. Development of infra-structure for storage and of meat for export	a) Cold storages, refrigerated transport	CWC/NAA/Port Trust/State undertakings, Association of meal exporters.	lump sum grant	Grant
	b) Acquisition of refrigerated vans.	Private entrepreneurs	10% of cost	Grant
7. Development of marketing facility	a) Acquisition of deep freezers refrigerators	State undertakings/cooperatives /Private entrepreneurs	a) upto 50% of the capital cost	Grant
	b) Acquisition of insulated vans		b) -do-	Grant
8. Development of trained manpower for meat processing industry	Training of manpower	CFTRI/IVRI/Agricultural Universities/undertakings/ institutions etc.	lump sum grant	Grant
9. R&D for meat processing and specialized packaging	a) Development of new techniques, new products new packaging techniques Pilot plants for specialized packaging	CFTRI/IVRI/Agricultural Universities/Govt and private organizations	lump sum grant	Grant
	b) Feasibility reports and studies on meat processing	-do-	upto Rs. 75,000/- in each case.	Grant

(Concluded)

ICFoST '95 HIGHLIGHTS

From Top to Bottom :
Inaugural function of ICFoST '95, seated from left to right Shri M. M. Krishnaiah, Co-chairman, National Steering Committee; Dr. V. Prakash, Chairman, National Steering Committee; Shri C. K. Basu, Jt. Secretary, Ministry of Food Processing Industries; Shri A. Ramesh, Chairman, Technical Committee; Dr. P. Narasimham, President, AFST(I); Shri C. K. Basu, inaugurating the convention by lighting the lamp; Registration of delegates

The Association of Food Scientists and Technologists (India) in collaboration with the Central Food Technological Research Institute, Mysore organized the Annual Convention (ICFoST '95) at CFTRI campus during September 7-9, 1995. The theme of the convention was "Food Process Engineering - Recent Trends and Developments". The Ministry of Food Processing, New Delhi, Government of Karnataka, Bangalore, NEPC Agro Foods, Madras, APEDA, New Delhi, All India Food Preservers' Association, New Delhi, Council of Scientific and Industrial Research (CSIR), New Delhi, Defence Food Research Laboratory (DFRL), Mysore, Department of Science and Technology (DST) New Delhi, Karnataka State Agro Corporation Ltd., Bangalore, Modern Food Industries (India) Ltd., New Delhi and National Horticultural Board, New Delhi, co-sponsored the convention in a big way.

The convention was inaugurated by Sri. C. K. Basu, Joint Secretary, Ministry of Food Processing Industries, Government of India. Dr. P. Narasimham, President, AFST(I) presided over the inaugural function. Dr. V. Prakash, Director, CFTRI, Mysore, delivered the keynote address. Sri. M. M. Krishnaiah, Dy. Director, CFTRI, Mysore welcomed the gathering.

Dr. Narasimham in his speech emphasised the role of food scientists in the new changed scenario of global competition and conservation of post-harvest produce. Dr. V. Prakash in his keynote address outlined the most recent technologies that are invading the food engineering sector to compete globally and identified the areas in which the work on post-harvest product improvement need to be carried out. That followed the lead technical session of Food Process Industrial Investment Policy and R&D interaction in which the leadpapers were by Mr. A. J. Advani, Advisor (Science and Technology), ICICI Ltd., Bombay, Dr. H. A. B. Parpia, Former Director, CFTRI, Mysore and Mr Anil Kumar Epur, Director, VST Natural Products, Hyderabad. Mr. A. J. Advani emphasised the new role taken by ICICI in creating investment opportunities for different technologies on various programmes and cited a few success stories of industrial investments. He also welcomed the industries to come forward to ICICI for funds for industrial investments. Dr. Parpia emphasised the need for a policy that too a long term and short term policy, keeping in view the global competition,

ICFoST '95 HIGHLIGHTS

environment, small holding of the farmers in which the farmer should not be ultimately neglected. Mr. Anil Kumar Epur talked on the role of CII in industrial investment and the policy of VST in R&D.

Delegates from India and abroad numbering about 650 participated in the following sessions. The delegates included dignitaries from abroad and from reputed industrial houses, universities, scientists, technologists, food consultants and entrepreneurs of India.

On the following topics, technical sessions were conducted.

Cryogenic Engineering

Cryogenic engineering is a recent technology in which emphasis lies on the product quality and longer shelf-life for horticultural produce is assured. Further, cryogrinding of spices has assumed a lot of importance in view of better grinding qualities and retention of aroma due to low temperature processing. There were six speakers who emphasised on quick freezing of foods, cryogrinding of spices and controlled atmosphere storage of foods.

Extrusion Cooking

Extrusion cooking is considered to be one of the recent technologies with high energy efficiency and shorter process time.

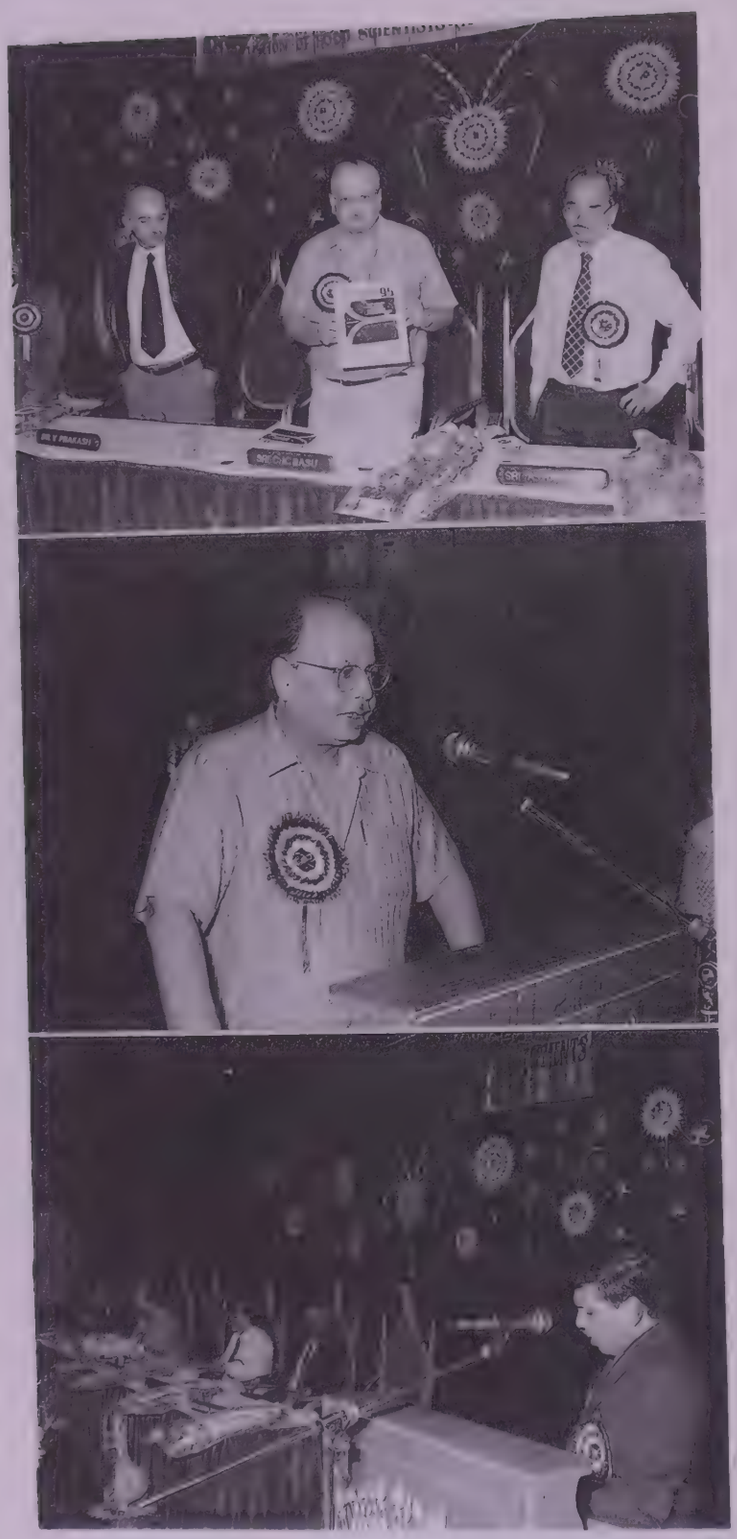
Dr. Akinori Nouguchi from Japan, emphasised his achievements of Extrusion Cooking in Japan and Ms. Kaye Burling from APV Baker, U. K. emphasised the strides taken on Extrusion Cooking in her country. There were three more Indian speakers who delivered talks on the development and design of Twinscrew Extrusion Cookers.

Food Process Systems (2 Sessions)

There were three lead lectures on design and development of various equipments delivered by Indian and Foreign speakers. Dr. David Farr, from Nestles Ltd., Switzerland and Dr. P. Schottler, Head, Beverage Division, Westfalia, Germany were noted foreign speakers who gave talks on High Pressure Technology for excellent bacterial free food products and separation and clarification of fruit juices. There were 15 speakers in both the sessions.

From Top to Bottom :
Shri M. M. Krishnaiah welcoming the delegates; Dr. P. Narasimham, delivering the presidential address; Dr. V. Prakash, delivering the keynote address

ICFoST '95 HIGHLIGHTS



From Top to Bottom :
Shri C. K. Basu releasing the Souvenir
Shri C. K. Basu addressing the gathering
Dr. K. Udaya Sankar, Secretary, AFST(I), proposing vote of thanks

Supercritical Fluid Extraction

This is also a recent technology for extraction of spices, other herbal products in which carbon dioxide is being used as a solvent. The technology is environmental friendly, no solvent residues in the final product, high product qualities and energy efficient that endeared the Indian entrepreneurs to explore the opportunities of putting up the plant. Prof. Harro Lentz of Univesitate - Gesam - thochschule Signe, Fachbereich 8, D - 570 068, Sigen, Germany delivered the lead talk. A number of speakers from IIT and CFTRI, where research is initiated in this novel technology presented papers.

Bioengineering

Dr. K. Niranjan of University of Reading, U. K. and Dr. P. K. Ghosh, Director, Department of Biotechnology, New Delhi were the lead speakers on the above subject. The former spoke on the biochemical engineering principles for enzyme applications in food processing while the latter dwelt at length on the present scenario and future prospects of biotechnology and bioengineering in food. There were nine other papers on this subject.

Membrane Technology

Membrane Technology is a separation technology for concentration of fruit juices and deslination of water used with lesser energies. The technology can also be effectively used for producing fruit juice concentrates of high quality, retaining its natural aroma.

There were five speakers apart from one speaker from Netherlands. The lead paper by Dr. H. H. Nijhuis from the Netherlands discussed challenges for membrane technology in food processing. There were 4 other papers on this subject.

Food Expo

A Food Expo was also organized with participation from M/s. Westfalia Separators India Ltd., HiMedia, Bombay, Industrial Research Ltd., New Zealand, Elico Instruments and others. Video presentations on carbon dioxide extraction, cryogenic engineering were also arranged.

ICFoST '95 HIGHLIGHTS

Recommendations at the Plenary Session

A Plenary session was conducted to evolve policy guidelines for government and industry. The following recommendations were made.

The objective and theme of the Indian Convention of Food Scientists and Technologists-95 (ICFoST '95) can be accomplished by raising the level of the engineering base of Food Processing to ensure efficiency of manufacturing and quality of product to market them globally. This has become more necessary at a time with the doors of the country opened to the world.

The gaps in knowledge have to be filled through indigenous research and development to modify, upgrade and raise viability. ICFoST '95 has examined the options for development of appropriate technology needed by the industry.

Food Policy

A comprehensive food policy has to be framed. A matching programme of action has also to be chalked out and an effective strategy for its implementation has to be worked out to meet not only the specific immediate needs but also the emerging ones in the next decade. Such a policy must enable to have a clear vision for building backward linkages with agriculture to raise produce for zero residue processing, building partnership between industry and R&D as well as academic institutions, and mobilise financial resources needed for technology development.

Cryogenic Engineering

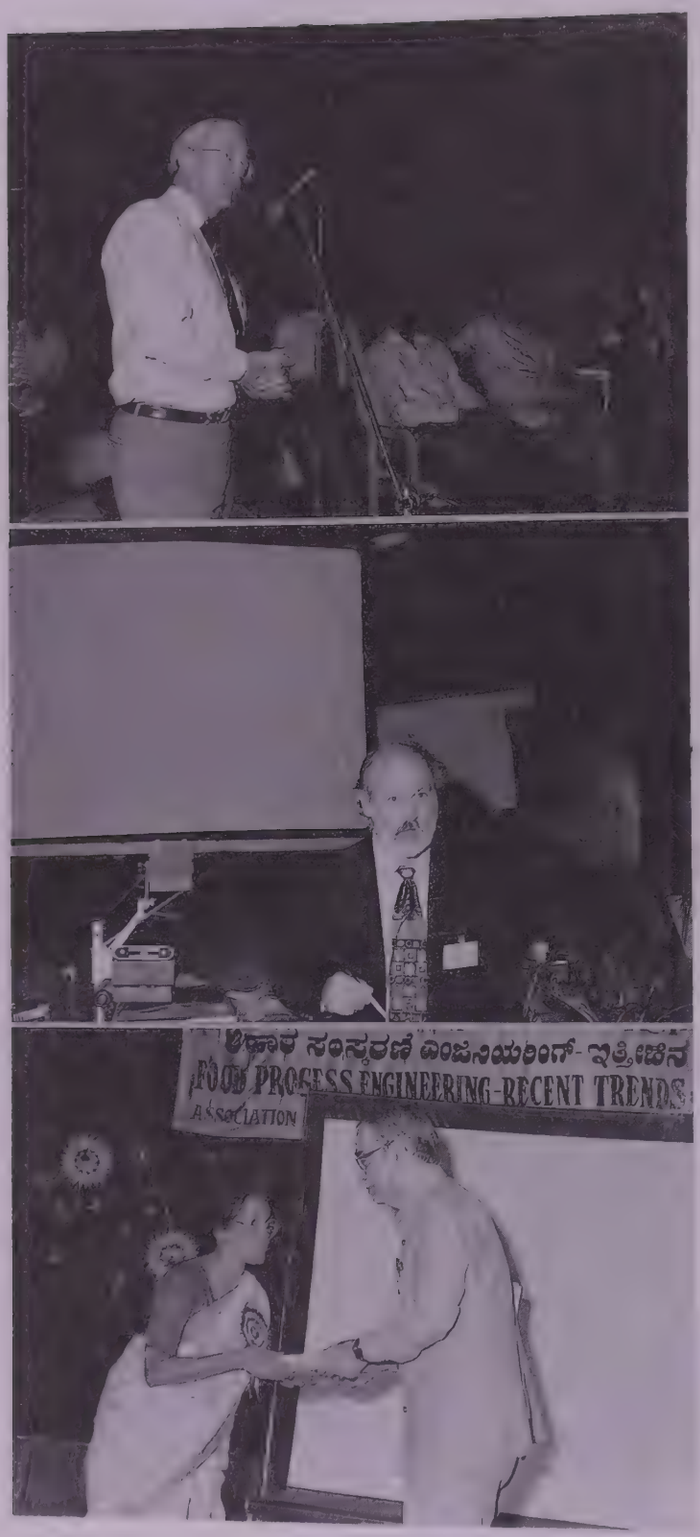
Application of cryogenics in food is a thrust area that could be translated into high quality products for exports. Establishment of cold chains in the country is the need of the hour to conserve and augment our resources and to reduce wastage.

Extrusion Cooking

The twin screw extrusion technology needs to be critically examined for exploitation in the country taking into consideration both traditional and modern food needs/demands. The equipment and maintenance costs at present are too high and are to be drastically reduced

From Top to Bottom :
Dr. H.A.B. Parpia, Former Director, CFTRI, addressing the gathering at the lead technical session; Shri A. J. Advani, Adviser (Science and Technology) ICICI presenting his lead paper at the technical session; Shri Anil Kumar Epur of VST presenting his lead paper at the technical session

ICFoST '95 HIGHLIGHTS



From Top to Bottom :
Dr. David Farr of Nestech Ltd.., Switzerland, presenting his paper; Dr. Dean Segal of Pope Scientific Inc. USA presenting his paper; Dr (Mrs) Rugmini Sankaran, Incoming President, AFST(I), receiving memento from Dr. H.A.B. Parpia

by indigenous R&D for making it economically viable, both for internal consumption and for export.

Super Critical Fluid Extraction (SCFE)

Data bank of process applications of SCFE should be set-up to fully utilise R&D efforts in various research and academic institutions and avoid duplication of work. Products need to be identified for high value addition, cost effectiveness and economic viability.

Bioengineering

Need exists for R&D efforts in understanding fundamental aspects of mass transfer in bioreactors and downstream processing equipments. Convention desired that emphasis should be given to the development of energy efficient equipment.

Membrane Technology

Clarification and concentration of tropical fruit juices should be intensively studied along with the design of membrane modules for practical applications. This will help in process standardization for separation of aroma, flavour, colour, antioxidants and bioactive compounds.

Heat and Mass Transfer Systems

High-tech approaches are necessary for dairy, beverages and fruit and vegetable utilisation. The technology to be developed should address the product quality improvements, substantial reduction in thermal energy, use of more of process controls to eliminate human failures and waste utilisation. Evaluation of various designs of short path distillation equipments for their suitability in refining of vegetable and other oils of commercial importance in India shall be undertaken by R&D Institutions and oil refining industry. Viable and cost effective, modern packaging designs, along with reliable heat processing schedules for longer shelf life are to be standardized.

Conclusion

The convention made a strong plea that an integrated approach, involving various governmental agencies such as Indian Council of Agriculture Research, Council of Scientific and Industrial Research, Ministry of Food Processing Industries, Department of Biotechnology, Department of Science and Technology,

ICFoST '95 HIGHLIGHTS

and various Commodity Boards and State Governments, is necessary for the development of infrastructure, upgradation of equipment and machinery, and consequently for developing the state-of-the-art technologies. These approaches will take us to the next century in developing products, which are eco-friendly, energy-efficient, amenable for local consumptions and can compete in the World Market for export.

Valedictory Function

The valedictory function to mark the conclusion of the annual convention was held on Saturday, the 9th September 1995 at IFTTC Auditorium, CFTRI, Mysore. In the absence of the Hon'ble Chief Minister, Shri H. D. Deve Gowda, three Karnataka Ministers, namely Hon'ble Shri S. Siddaramaiah, the Finance Minister, Hon'ble Shri P.G.R. Sindhia, the Home Minister and Hon'ble Shri D. T. Jayakumar, Horticulture Minister were present and addressed the gathering. The ministers expressed their happiness for being able to attend this function on behalf of the Chief Minister and congratulated the organizers in conducting this important convention on a very important subject. They assured all help from the government for the efforts of scientists of CFTRI in implementing various research programmes for the welfare of the common man. Earlier Dr. P. Narasimham, President, AFST(I) welcomed the gathering. Dr. V. Prakash, Director, CFTRI summarized the proceedings of the convention. Dr. K. Udaya Sankar Hon. Secretary, AFST(I) proposed a vote of thanks.

Various annual awards of the Association and also the prizes for the winners of the best posters were presented. The details are as follows :

Awards

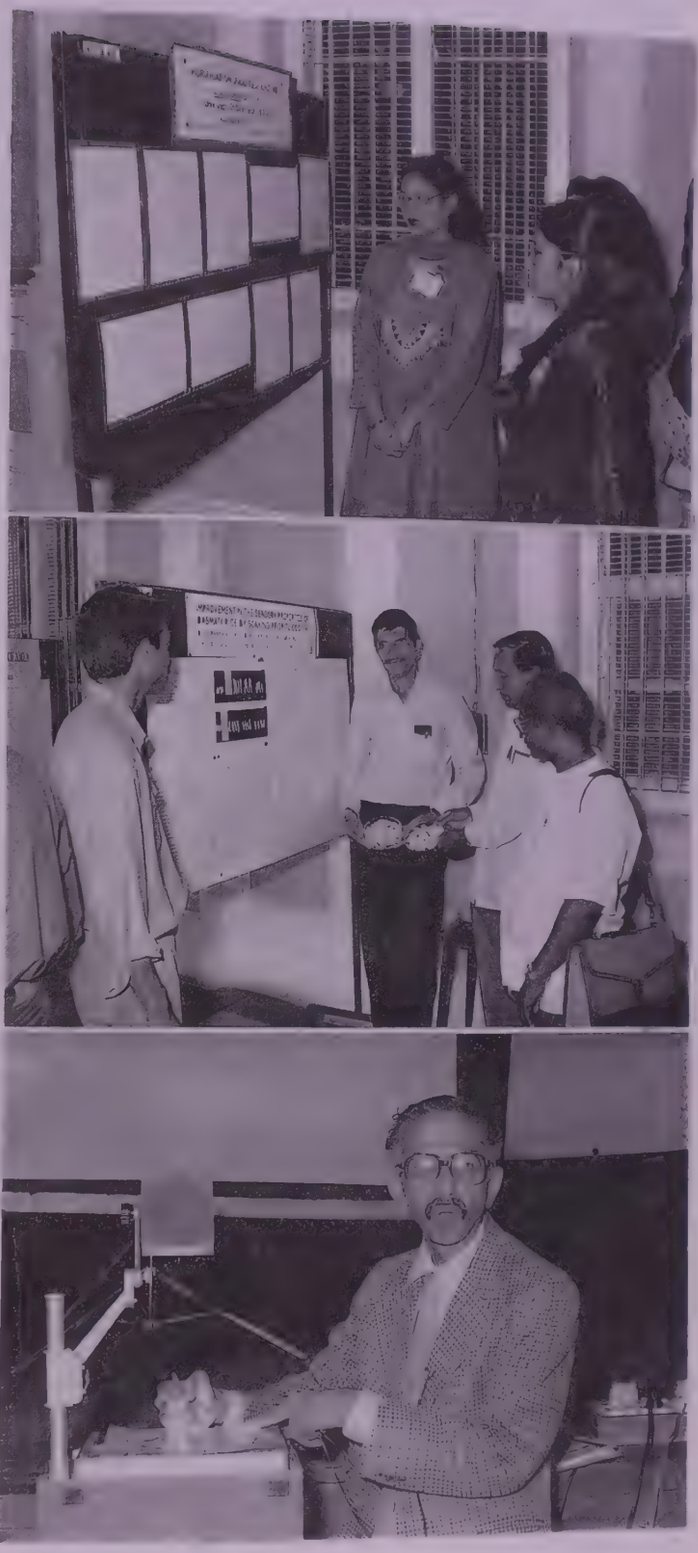
The following is the list of distinguished scientists and technologists for the various annual awards of AFST(I) for the year 1994.

Prof. V. Subrahmanyan Industrial Achievement Award

Sri. Vikram Reddy, Managing Director, Nutrine Confectionery Company Limited, B. V. Reddy Colony, P. B. No. 38, Chittoor - 517 001

Laljee Godhoo Smarak Nidhi Award

Dr. G. A. Ravishankar, Head, PCBT Department, CFTRI, Mysore and team



From Top to Bottom :
Poster sessions in progress;
Dr. N. G. Karanth presenting a paper at the technical session

ICFoST '95 HIGHLIGHTS

From Top to Bottom :
Shri S. Siddaramaiah, Honourable Finance Minister, Govt. of Karnataka, being received by Dr. V. Prakash; Shri P.G.R. Sindhia, Honourable Home Minister, Govt. of Karnataka, being received by Dr. K. Udaya Sankar.; Valedictory function in progress.

Young Scientist Award

Dr. (Ms.) Rintu Banerjee, Lecturer, Biotechnology Unit, Indian Institute of Technology, Kharagpur - 721 302

Best Student Award

Mr. Vinay Kumar, University of Agricultural Sciences, College of Fisheries, Mangalore - 575 002

Best Paper Award

Dr. S. Yella Reddy, Scientist, Lipid Technology Department, CFTRI, Mysore.

AFST(I) Fellows

Dr. (Ms.) D. Vijaya Rao, Scientist, DFRL, Siddhartha Nagar, Mysore - 570 011

Dr. Susanta K. Roy, Project Coordinator (PHT), Divn of Horticulture & Fruit Technology, I.A.R.I., New Delhi - 110 011

Dr. B.S. Bhatia, S-276, Greater Kailash II, New Delhi - 110 048

Dr. S. R. Padwal Desai, Food Mycology Group, Biochemistry & Food Technology Division, B.A.R.C., Trombay, Bombay - 400 085.

Best Poster Awards :

Analytical Methodology

First Prize

Estimation of vinyl chloride monomer in poly-vinylchloride and food material -

P. Ravi, N. S., Vijayalakshmi, P. Srinivas and Baldev Raj, Packaging Technology Department, CFTRI, Mysore - 570 013.

Second Prize

Development of a computer program for thermal process evaluation -

M. N. Ramesh and M. S. Deepak, Food Engineering Department, CFTRI, Mysore - 570 013.

Biochemistry

First Prize

Inhibitory effect of spices on the histamine production and histidine decdarboxylase activity of *proteus morganii* and on whole mackerel stored at 30^0C

R. Jeya Shakila, T. S. Vasundhara and D. Vijaya Rao, Defence Food Research Laboratory, Mysore - 570 011.

Second Prize

Bowman-Birk double headed protease inhibitors from horse gram (*Dolichos biflorus*)

ICFoST '95 HIGHLIGHTS

Y. N. Sreerama, J. R. Das, D. Rajagopal Rao and L. R. Gowda, Biochemistry and Nutrition Department, CFTRI, Mysore - 570 013.

Biotechnology and Microbiology

First Prize

Use of fungi to obtain cell free xanthan

T. R. Shamala and R. Triveni, Microbiology Department, CFTRI, Mysore - 570 013.

Second Prize

Incidence of *Salmonella* in milk and milk products

Mallesha, K. S. Manja and R. Sankaran, Defence Food Research Laboratory, Mysore - 570 011.

Third Prize

Control of microbial contaminants in *Spirulina platensis* using antimicrobial agents

R. Sarada, G. Manoj, N. Keshava, G. A. Ravishankar and L. V. Venkataraman, Plant Cell Biotechnology Department, CFTRI, Mysore - 570 013.

Confectionery and Convenience Foods

First Prize

Development of therapeutic sweet bread

D. Indrani and G. Venkateswara Rao, Milling and Baking Technology Department, CFTRI, Mysore - 570 013.

Second Prize

Antioxygenic salts - Development and its efficiency in stabilisation of potato chips during storage.

G. K. Sharma, A. D. Semwal, M. C. Narasimha Murthy and S. S. Arya, Defence Food Research Laboratory, Mysore - 570 011.

Third Prize

Optimization of candy production from fresh tender ginger

S. R. Sampathu, H. B. Sowbhagya and N. Krishnamurthy, Plantation Products and Flavour Technology Department, CFTRI, Mysore - 570 013.

Animal Products and Dairy Science

First Prize

Thermal degradation of 5'-inosine monophosphate in a meat fibre mode system

V. K. Modi, D. Mottram and A. J. Taylor, Animal Products Technology Department, CFTRI, Mysore - 570 013.

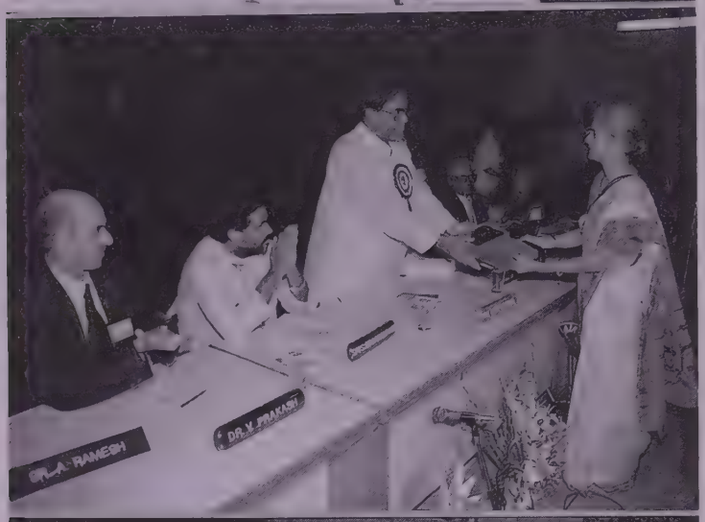
Second Prize

A feasibility study of compression milk tabletting

Alok Shah, Defence Food Research Laboratory, Mysore - 570 011.

From Top to Bottom :
Dr. V. Prakash discussing a point with the Finance Minister
Shri P.G.R. Sindhia, Honourable Home Minister addressing the gathering; Shri D.T. Jayakumar, Honourable Horticulture Minister addressing the gathering

ICFoST '95 HIGHLIGHTS



From top to bottom :
Shri V. Vikram Reddy receiving Prof. Subrahmanyan Industrial Achievement Award from Home Minister; Dr (Mrs) D. Vijaya Rao being honoured as Fellow of AFST(I); Prof. B.S. Bhatia being honoured as Fellow of AFST(I)

Third Prize

Growth and meat quality of broiler chicks and with fermented fish viscera silage

Javeed Ahmed and Mahendrakar N. S., Animal Products Technology Department, CFTRI, Mysore - 570 013.

Food Engineering

First Prize

Effect of grinding methods on the retention of pepper volatiles

C. T. Murthy, N.Krishnamurthy, T. Ramesh and P. N. Srinivasa Rao, Food Engineering Department, CFTRI, Mysore - 570 013.

Second Prize

Solderability of indigenous aluminium cans for tin soldering

S. Nataraj, A. Ramakrishna, A. N. Srivatsa and V. Subramanian, Defence Food Research Laboratory, Mysore - 570 011.

Third Prize

Scale up studies on continuous *idli* making unit

C. T. Murthy, S. P. Shidenur, Shivaprakash, D. S. Raju and Nanjundaswamy, Food Engineering Department, CFTRI, Mysore - 570 013.

Consolation Prize

Mathematical modelling of osmotic dehydration under vacuum - A case study of coconut

N. K. Rastogi and K. S. M. S. Raghavarao, Food Engineering Department, CFTRI, Mysore - 570 013.

Foodgrains and Starches

First Prize

Functional properties of thermally treated legume flours

B. Nagmani and Jamuna Prakash, Department of Studies in Food Science and Nutrition, Manasagangothri, Mysore.

Second Prize

Effect of cooling and heating on resistant starch formation in gelatinized food starches

Susan Verghese and Jamuna Prakash, Department of Studies in Food Science and Nutrition, Manasagangothri, Mysore.

Third Prize

Improvement in the sensory properties of *basmati* rice by soaking prior to cooking

ICFoST '95 HIGHLIGHTS

B.V. Hirannaiah, M. K. Bhasyam and S. Z. Ali, Grain Science Technology Department, CFTRI, Mysore - 570 013.

Fruits and Vegetable Technology

First Prize

Development of post-harvest package of technology for export of banana (Var. Rasthale) by ship

S. Mallikarjuna Aradhya, B. Aravinda Prasad, S. G. Kulkarni, M. S. Vasantha and K. V. Ramana, Fruit and Vegetable Technology Department, CFTRI, Mysore - 570 013.

Second Prize

Development of storage method for extension of storage life of *capsicum* (Var. Bullnose) for export by ship

B. Aravinda Prasad, K. V. Ramana, Habibunnisa and S. M. Aradhya, Fruit and Vegetable Technology Department, CFTRI, Mysore - 570 013.

Third Prize

Method for the preparation of ash gourd candies with improved colour flavour and taste

A. Usha Devi, P. Narasimham and W. E. Eipeson, Fruit and Vegetable Technology Department, CFTRI, Mysore - 570 013.

Consolation Prize

Processing and packaging techniques of jaggery powder for improved shelf life

S. Ramakrishna Rao and C. Lakshminarayana, Regional Agricultural Research Station, Anakapalli - 531 001.

Oil Seeds and Lipid Technology

First Prize

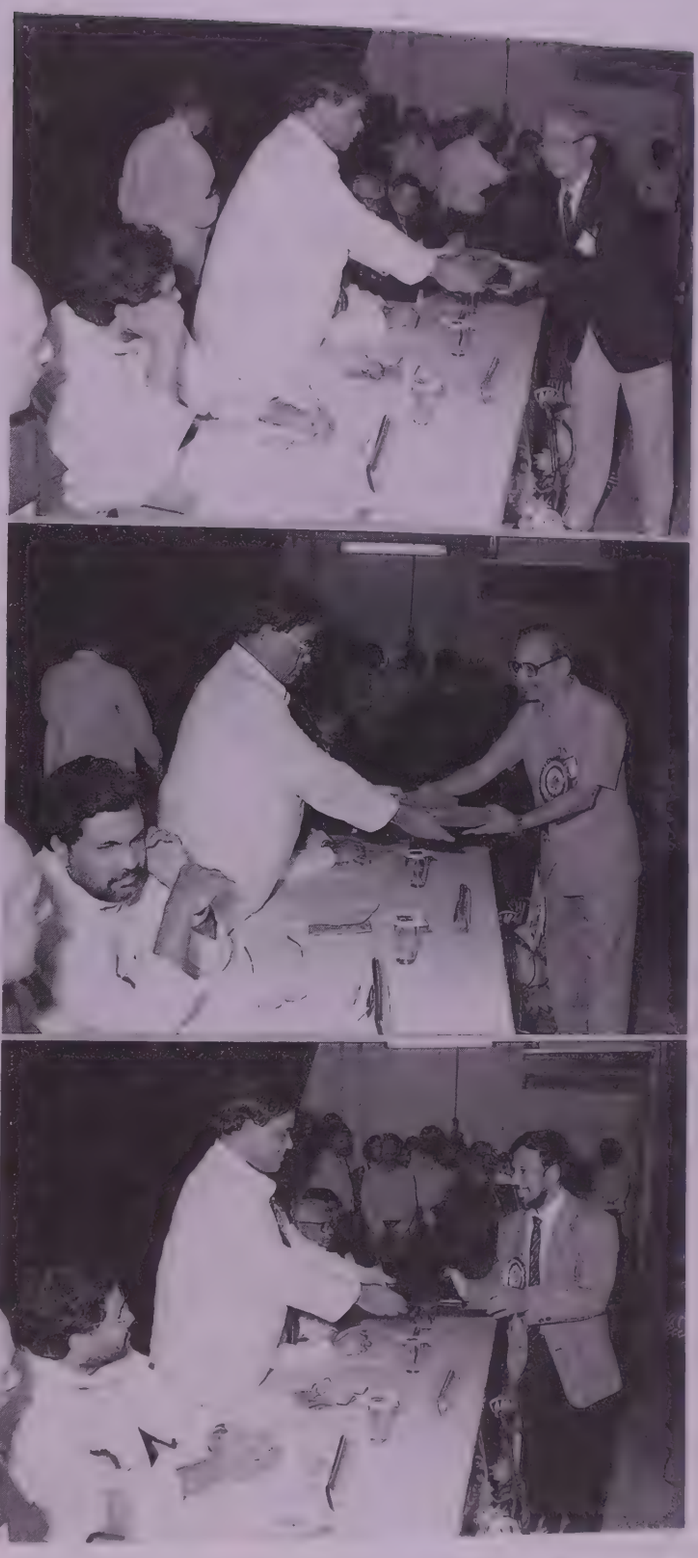
Economical and functional packages based on the effect of temperature and relative humidity on the peroxide value of refined groundnut oil

A. R. Indiramma, U. V. Chetana and K. R. Kumar, Packaging Technology Department, CFTRI, Mysore - 570 013.

Second Prize

Study of hydrolysis pattern of soya flour protein using mixed enzymes

Manjusha Kulkarni, M. G. Bhotmange and P. N. Shastri, Lakshminarayana Institute of Technology, Nagpur - 440 010.



From top to bottom :
Dr. S.K. Roy being honoured as Fellow AFST(I)
Dr. A.S. Gholap, Vice-President, AFST(I), Bombay Chapter, receiving Fellow AFST(I) Award on behalf of Dr. S. Padwal Desai; Dr. Ravishankar, receiving Laljee Godhoo Smarak Nidhi Award

Wanted

Food Technologist

We are a 100% EoU manufacturing spray dried Hydrolysed Vegetable protein (HVP) and Hydrolysed animal protein (HAP) from soya, gelatin etc. and exporting to Japan, South Korea, Europe & South East Asia. We are looking for an experienced, result oriented, Food Technologist for heading our application laboratory and New Product Development.

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FEATURE ARTICLES

Production, Processing and Consumption Patterns of Mushrooms

Applications of Immobilized Enzymes and Cells in the Processing of Soymilk and Soyfoods

Quest for Quality in Food Sector - Role of Standards

Production, Processing and Consumption Patterns of Mushrooms

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[1] Dairy Technology Division
[2] Dairy Microbiology Division
National Dairy Research Institute
Karnal - 132 001, India

Introduction

There has always been a lack of harmony between the rapidly growing world population and the adequate supply of protein-rich foods in the human diets. Many traditional and conventional methods exist for producing protein-rich foods through animal husbandry and agricultural means. Even the knowledge of the present modern biotechnology and the advanced agricultural practices may not be sufficient to meet the rising and expected high protein demands. However, this magnitude of over and ever increasing need for food protein has made it necessary to explore unconventional protein sources to supplement a part of this need. One of the most promising and important sources of unconventional protein is the Single Cell Protein (SCP). Mushrooms are the oldest SCP foods of man, grown by solid state fermentation. At present, mushroom cultivation is the only major fermentation industry which involves the bioconversion of cellulosic wastes into edible biomass.

Mushrooms are a special group of macroscopic fungi and lack chlorophyll and therefore, need a substrate for their own absorptive nutrition. Mushrooms produce enzymes that degrade complex organic matter and absorb the soluble substances (Chang and Miles, 1989). Mushrooms have been consumed by human races through ages. The word 'mushroom' is thought to be derived from the French word 'mousseron', 'mouse' or 'moss' (Anon. 1994), while in India it is known as *ksumpa* in Sanskrit and *Khumbi* or *Kukurmutta* in Hindi. The method of cultivation was recorded as early as 300 BC and their intentional cultivation was started as early as 600 AD in China. Artificial cultivation of mushrooms was initiated in France around 1650 AD and rapidly spread to entire Europe continent as a garden crop. In the early years of 19th century, mushrooms were commercially cultivated inside the caves in France. According to experts, the mushroom consumption was first tried out by the Chinese. However, during the process of identifying the edible ones, hundreds of people died by consuming the poisonous mushrooms.

At present, mushroom cultivation is the only major fermentation industry which involves the bioconversion of cellulosic wastes into edible biomass.

There are around 38,000 mushroom varieties known to exist.

Cultivation of Mushrooms

Varieties

There are around 38,000 mushroom varieties known to exist. However, about 100 of these are considered edible. Of the edible varieties, the most popular ones are the *Agaricus bisporus* (the European or white button mushroom), *Lentinus edodes* (*Shiitake* or the Japanese mushroom), *Pleurotus* sp. like

Pleurotus ostreatus (American oyster mushroom) and the *Pleurotus sajor-caju (Dhingri* or Indian oyster mushroom),*Volvariella volvacea* (the Chinese or paddy straw mushroom), *Flammulina velutipis* (the winter mushroom) and the *Auricularia polytricha* (Jew's ear mushroom).

India is known globally for its exotic mushrooms. Depending on the suitability of the region, climate and the different temperature ranges for their growth, the distribution of these varieties is varied in different parts of the country. Of the known varieties, the *"Gucchi"*, morel or black mushroom, collected as a wild growth from the coniferous forests in Himachal Pradesh, Jammu & Kashmir and Uttar Pradesh is the most well known.

Button mushrooms are cultivated in Himachal Pradesh, Uttar Pradesh, Delhi, Pune, Bangalore and Ooty.

Oyster mushrooms are cultivated in Himachal Pradesh, Delhi, Bangalore and Mysore.

Paddy straw mushrooms are cultivated in most parts of the southern region.

Auricularia is grown in the foot hills and plains. (See also data bank)

Cultivation Methods

Traditionally, the cultivation of mushrooms was mostly pertinent to the hilly region. Currently, the adoption of newer scientific approaches in the cultivation methods, has led to better quality and yields in mushroom. The cultivation, in general, comprises four stages : (I) Composting, (II) Spawning, (III) Casing and (IV) Harvesting. Much of the literature has been published on this subject in the recent past (Hatch and Finger 1979; Cho and Nair 1987; Kapoor 1989; Chang 1990 a, b). A recent review also discusses in detail about the production aspects of the mushrooms, in particular, the button mushrooms (Anon, 1994a).

Production of Mushrooms

Due to the spread of mushroom cultivation all over the world and the advances in the mushroom cultivation and processing, there has been a tremendous increase in the production of edible mushrooms. The estimated global production for mushrooms in 1990 was at about 3.7 million tonnes. USA was the largest producer with 21% of the production, while China and France accounted for about 14% and 12%, respectively. Of the world's mushroom production, 37.7%, in both production and consumption, is of the button mushrooms. The oyster mushroom follows closely with a share of 24.1%, while, the *Shiitake* and *Auricularia* tie at 10.6% apiece and the paddy straw variety trails in at 5.5% (Anon, 1994b). However, India does not figure on the International scene. The present statewise mushroom production in India is presented in Table 1. According to the sources form the Agricultural and Processed Food Products Export Development Authority (APEDA), India's

Table 1. Statewise Production of Mushrooms in India

State	*1992-93* (tonnes)
Andhra Pradesh	300
Bihar	5
Delhi	500
Gujarat	10
Haryana	1650
Himachal Pradesh	2000
Jammu & Kashmir	300
Karnataka	500
Kerala	300
Madhya Pradesh	200
Maharashtra	250
Orissa	50
Punjab	1200
Rajasthan	5
Tamil Nadu	1200
Uttar Pradesh	2500
West Bengal	50
Others	500
Total Production	**11520**

Source : Sharma and Rai, 1994

Table 2. Exports of Mushrooms from India

	1990-91		1991-92		1992-93	
	Quantity	Value Rs. Lakhs	Quantity	Value Rs. Lakhs	Quantity	Value Rs. Lakhs
Dried	44.5	745.3	49.2	1222.4	-	-
Processed	126.0	76.3	1174.8	381.2	3294	1081.0

Quantity in metric tonnes

exports for dried and processed mushrooms are given in Table 2. Some of the major markets where the mushrooms were exported are Germany, Switzerland, France, USA and Canada.

Nutritive Value of Mushrooms

Mushrooms are consumed in a variety of ways because of their delicious flavour. The food experts have realized and increasingly appreciated the food value of mushrooms because of the low calorific value and very high contents of proteins, vitamins (B-group) and minerals. Normally, mushrooms contain from 20-40% proteins on dry weight basis and thus surpass many foods, in terms of protein content. The proteins of mushrooms are of high quality and rich in various essential amino acids. Crisian and Sands (1978) have reported that mushrooms contain more proteins than most other vegetables. Even the available vegetable proteins upto 70 to 90% in fresh mushrooms can be easily digested. Mushrooms have a low carbohydrate content, no cholesterol and are almost fat free (0.2g/100). Therefore, they form an important constituent for a balanced food. According to the FAO, mushroom proteins can serve as food contributing proteins in developing countries, where the population mainly depends on cereal-based foods (FAO, 1970).

Since mushrooms contain high quality proteins, they can easily replace other animal proteins like milk and meat which are expensive. Hence, it can be an answer for the protein malnutrition prevalent in most of the developing and underdeveloped countries of the globe. Mushrooms with regard to their good nutritional and high digestibility values are gaining importance in today's healthy diet. Even in this era of vegetarian consciousness and healthy eating, the mushrooms are, in fact, proving to be an excellent meat substitute.

Since mushrooms contain high quality proteins, they can easily replace other animal proteins like milk and meat which are expensive.

Medicinal Value of Mushrooms

With regard to health benefits and medicinal value, edible fungi produce secondary metabolites, which are biologically active. These secondary metabolites get stored in the fruit bodies of the edible fungi which possess various therapeutic properties. *Lentinus edodes* has been shown to contain anti-tumour, anti-viral and hypolipidemic agents (Moore *et al.*, 1985). The hypolipidemic and the hypocholesterolemic properties are due to eritadenine (2,3- dihydroxy-4-9-adenyl) - butyric acid (Chibata *et al.*, 1969). The anti-tumour properties are due to the polysaccharides lentinans and emitanin-1 (Chihara *et al.*, 1970).

In addition to anti-tumour, anti-cholesterol and anti-thromobic effects of mushrooms, *Shiitake* mushrooms can help in preventing high blood pressure, atherosclerosis, kidney ailments, diabetes, cataract, neuralgia, gallstones, numbness of the hands and feet, haemorrhoids and also improves sexual powers (Mori, 1974). In the *Ningyotake* mushroom (*Polyporus confluens*), the two principal components, namely, grifolin (2-trans, trans - farnesyl-5- methylresorcinol) and neogrifolin (4-trans, trans-farnesyl-5- methylresorcinol) are responsible for contributing to the hypocholesterolemic action (Sugiyama *et al.*, 1992 a,b). Moreover, protein containing polysaccharides having anti-tumour activity were reported from *Pleurotus sajor caju* by Zhaung *et al.*, (1993).

Trends in Processing of Mushrooms

Mushrooms are readily perishable commodities and they start deteriorating immediately

after their harvest. They develop a brown discolouration on the surface of the mushroom caps due to the enzymatic action of phenol oxidases and they quickly become soft at a high temperature. The rate of respiration activity of the harvested mushrooms is high, in comparison, to the other horticultural crops and this results in a shorter post- harvest life (Lutz and Hardenberg, 1968).

In view of their high perishable nature, the fresh mushrooms have to be preserved to extend their shelf-life for off-season use. Among the various methods employed for its preservation, canning is the most frequently adopted method on commercial scale. Mushrooms can be processed in many other novel ways to extend their shelf-life, as it can be dried, pickled and canned. Drying is the most studied process and recently the trend is increasing towards the irradiation of mushrooms. Currently, in India, very few companies are engaged in the processing of mushrooms and that too are limited to the pickling and canning processes. The various methods of preservation are as follows :

Blanching

Mushrooms are more susceptible to enzymatic browning when dried in a moist condition at 30-35^{0}C, but browning can be inhibited if the temperature is above 60^{0}C. The colour and textural changes are minimum when air inlet temperature is 65-68^{0}C. The losses during blanching can be minimized by vacuum treatment of mushrooms with 1% xanthum gum (Gormley, 1986). However, the blanching of mushrooms by immersion in boiling water for 2 minutes, helped in obtaining good quality dried mushrooms (Kapoor, 1989).

Subsequent studies on the blanching of oyster mushrooms showed that blanching carried out at 80^{0}C for 2 minutes was adequate to inactivate the peroxidase enzyme activity. However, blanching for prolonged periods caused a substantial loss in nutrients (Riaz *et al.*, 1991). Beauvais (1992) successfully processed mushrooms using a salt-free liquid treatment consisting of rice starch, xanthum gum, pure egg white protein and water. The impregnated mushrooms were blanched in water at 90-100^{0}C during which the liquid gels in the mushroom, improved the taste, texture and increased the yield.

Currently, in India, very few companies are engaged in the processing of mushrooms and that too are limited to the pickling and canning processes.

Steeping

This method of preservation is simple and economical. Steeping of water-blanched mushrooms in 1% potassium metabisulphite (KMS) along with 0.2% citric acid (overnight) before drying improved colour, texture and reconstitution properties (Pruthi *et al.*, 1978). However, the blanched mushrooms can also be preserved in a steeping solution consisting of 2% sodium chloride, 2% citric acid, 2% sodium bicarbonate and 0.15% KMS for a period of 8-10 days at 21-28^{0}C (Kapoor, 1989).

A low cost technology was developed for preserving mushrooms in a chemical solution of 2% salt, 2% sugar, 0.3% citric acid, 0.1% KMS and 1.0% ascorbic acid by using a steeping preservation technique with blanching as an essential pre-treatment. The recommended pre-blanching before preservation caused the enzyme inactivation and further helped in keeping check of the colour deterioration during storage. Moreover, the whole blanched mushrooms retained good colour, flavour and texture and could be stored upto 6 months and were acceptable even upto one year, whereas the unblanched mushrooms could be stored only upto 3 months (Sethi *et al.*, 1991).

Vacuum Cooling

At ambient temperatures, mushrooms can be stored only for 2-3 days and cooling extends the shelf-life for a few days. Cooling of mushrooms is an immediate step that has to follow pickling whether they are intended for fresh market or for processing. Using forced-chill air, ice bank or vacuum cooling systems, mushrooms can satisfactorily be cooled to 2-4^{0}C. Conventional cooling systems are time consuming and vacuum cooling is becoming more popular.

Vacuum cooling is a rapid and uniform process, where mushrooms are subjected to very low pressures and water evaporates from the mushrooms giving off the latent heat of vaporization, thus cooling itself. Although, the process resulted in some weight loss, the vacuum-cooled mushrooms had superior colour when compared to conventional cooled mushrooms (Gormley, 1986; Frost *et al.*, 1989). Air spray moist chillers can also rapidly cool mushrooms. The temperature can be lowered by 16-18^{0}C in one hr without any moisture losses (Linfield, 1990). For distribution of cooled mushrooms, the use of insulated containers minimizes the weight loss and browning during transportation and storage. Thermotainers are insulated boxes that hold six euthetic plates which allow a

minimum temperature rise (the temperature of mushrooms cooled to 2^0C was raised by 5^0C in 20 hrs) of the product (Noble, 1990).

Drying

Drying is a well established processing method for preservation of mushrooms. The mushrooms can be dried on wire trays and warm air (at 50^0C) is passed over the mushroom slices. At a temperature of 55-60^0C, the insects and microbes on the slices will be killed in a few hours and dried mushroom slices (12% moisture) are packed in air tight containers with shelf-life of more than one year (Bano *et al.*, 1992). However, drying is an unsteady state process, carried out under diffusion rate of water through the mushroom slices. The factors that affect drying rate are temperature and thickness of mushroom slices, ratio of air film to mushroom resistance towards water diffusion (Yapur *et al.*, 1990). The drying should also be achieved in a shorter time period to minimize the brown discolouration (Flegg, 1991). Sulphitation followed by drying has also proved to be the best method of pretreatment of mushrooms (Jorge and Chaves, 1992).

Mushrooms can also be processed by microwaves. The mushrooms when dried with combined hot air - microwave treatments at different hot air flow temperatures viz., 35, 40, 60 and 75^0C, showed that the combined treatment shortened the process time, yielding a good quality final product. However, retention of the characteristic aroma compound (1-octen-3-ol) and its oxidation product (1-octen-3-one) were positively affected by microwave drying (Riaz *et al.*, 1991). Moreover, a comparative study on the efficiency of drying by hot air and a combined hot air - microwave treatments at different temperatures showed that the use of combined treatment gave a quality product of satisfactory rehydration and flavour retention (Riva *et al.*, 1991).

Osmotic Dehydration

A continuously circulated contacting reactor for osmotic dehydration of sliced mushrooms was designed by Yang and Maguer (1992). The mushroom slices are blanched in 15% salt solution for the optimum removal of water and loading of salt. An equivalent process also includes an additional step of osmotic dehydration in a 60% sucrose solution for 10 minutes before treatment with the salt solution.

Canning

A standardized process for the canning of mushrooms is documented by Kapoor (1989). Mushrooms are washed in water containing 0.1% citric acid and 0.3% sodium metabisulphite to prevent browning. Blanching is done in boiling water for 2 to 3 minutes and then washed in cold water containing 1% sodium chloride and 0.5 to 1% citric acid. In this process of boiling, there is a sufficient loss in weight. However, steam blanching is recommended as there are minimum losses in weight. The blanched mushrooms are then filled up to 3/4 of the can with brine, heated to 80-85^0C in steam or boiling water and then sealed. Further, the cans are sterilized at 0.7 Kg/cm^2 for 25 minutes, followed by cooling in water. The storage of the sterilized cans is done at ambient temperature.

Pickling

Mushrooms pickles are popular all over the world. Zhuk and co-workers patented a hot pickling process, wherein cleaned mushrooms were blanched in hot water (80^0C for 5 minutes), rapidly cooled and added to 60% brine to obtain mushrooms to a brine ratio of 7:3 by volume. The mixture was held at 15-20^0C for 15 days for fermentation and further held at 0-4^0C to obtain a pH of 3.9. Sugar was added to the preparation at the rate of 3.3% by weight to the brine and final salt concentration reached to 6.6% by weight (Zhuk *et al.*, 1991).

Kreb and Lelley (1991) preserved oyster mushrooms by active lactic acid fermentation. A 3-7 days old brine from an active sauerkraut fermentation was used as a starter. Total acidity of 0.55-0.71% lactic acid was at 21^0C after 10 days. When co- fermented with fresh shredded cabbage, an acid concentration of 1.21% was obtained after 10 days. The product had mild pleasant taste and was stable for 6 months at ambient temperature.

Freezing

In cryogenic freezing, mushrooms are subjected to blast freezing at -30^0C for 30 minutes and stored at -18^0C in a deep freeze. The mushrooms retained the flavour, colour and appearance below - 18^0C. However, those stored above -12^0C were prone to browning. Vacuum treatment of mushrooms with 1% xanthum gum for 12 minutes before blanching and freezing minimizes weight and colour loss during blanching and enhances texture of frozen mushrooms (Gormley, 1986; Kapoor, 1989). The first pilot plant trials for freezing of mushrooms on industrial scale were initiated in France in 1969. Mushrooms were frozen at -20^0C and the moisture was removed by sublimation at a very low vacuum for 12-16 hours. The freeze-dried mushrooms were brittle, but had a superior flavour and appearance (Kapoor, 1989).

Irradiation

Low doses of γ-radiations can be used to reduce the contamination and extend the shelf-

life of mushrooms. It effectively controls deterioration of fresh mushrooms due to normal senescence and exerts lethal action on microbes. It can potentially delay the development of cap, stalk, gill and spore and also reduces the loss of water, colour, flavour, texture and delays the quality losses of washed mushrooms. It can double the shelf-life of mushrooms from 1-3 to 6-7 days. The common source of γ-rays is Cobalt-60. Although food material can be subjected to a dose of 10 KGy (Kilo Gray), which in its capacity can completely destroy microorganisms. In many countries, the use of ionising radiations for food preparations is legalized.

Blackholly (1989) recommended a dose level of 2 KGy and a storage temperature of 10^0C for extending the shelf-life of mushrooms and a minimum dose of 1.75 KGy for destroying post-harvest fungi. An optimum dose of 1 KGy lowered bacterial counts upto 6 logs and significantly lowered yeasts and moulds (Beelman, 1988). When mushrooms were subjected to an irradiation level of 25 KGy with dose rates of 4.5 KGy/hr and stored upto 12 days at 15^0C and 90% relative humidity, the shelf-life was extended by 4 days. By the use of lower dose rates, the steep growth and darkening of the cap can be better controlled (Beaulieu *et al.*, 1992). However, the level of dose depends on the distribution time, temperature and relative humidity of storage and type of containers. At present, irradiation plants are expensive and it needs protection from evaporation loss and so suitable overwraps or packages for irradiation of mushrooms have to be chosen for the purpose (Nicholas, 1988).

Irradiation was also tried in combination with heat for the processing of mushrooms. Minnar and McGill (1992 a,b) optimised a heat-irradiation process to obtain commercial sterility of mushrooms in cream sauce in pouches. When mushrooms were processed at a temperature of 120^0C, two combination treatments of F_o values of 2+2.5 KGy and 1+4.5 KGy proved applicable. A comparative study on the efficiency of packaging material for mushrooms preserved by irradiation showed that irradiation at low levels (KGy) proved better than higher irradiation levels of 1 and 2 KGy. Moulded paper pulp containers, cartons with hot melt or polyethylene liners and plastic baskets or trays with extruded PVC liners permeable to water vapour gave the best results (Kubera *et al.*, 1991).

Mushroom foods are enjoyed as a delicacy and its consumption is rapidly increasing as they have remarkable taste, flavour and nutritive value.

Controlled Atmospheric Storage

In the recent years, controlled atmospheric storage, a novel preservation technique is catching up fast for all types of fruits and vegetables. In this method, the concentrations of carbon dioxide and oxygen are altered in the environment where the product is packed. The respiration rate also gets altered. Due to this, the brown discolouration (enzymatic browning) is reduced and the storage shelf-life is extended (Lopez-Briones *et al.*, 1992; Halachmy and Mannheim, 1992).

Processed Mushroom Foods

In the recent years, the gourmet appeal of mushrooms is gaining popularity and the consumer's demand for varieties has led to the processing of mushrooms to processed foods like chutneys, pickles, soups, flavours etc. Researchers from the Dr. Y. S. Parmar University of Horticulture and Forestry, Solan, standardized a recipe for the preparation of sweet mushroom chutney. However, precooking of the mushrooms under pressure was a prerequisite for the absolute microbiological safety and increased shelf-life of the product (Joshi *et al.*, 1991).

Soups have already played an important role as a delicacy and have been a part of meals in parties and celebrations. Various formulated soups have gained popularity because of their nourishing and appetizing qualities and have created their position in the food habits of many countries. Efforts have been made in our laboratory to formulate an instant mushroom whey soup powder (Ghosh, 1994). Since mushrooms lack in sulphur containing amino acids viz., cysteine, cystine and methionine, the supplementation of mushrooms with whey proteins which are rich in these amino acids, would increase the protein quality of soups in terms of protein efficiency ratio and net protein utilization. This process will also have the dual advantage of whey utilization and the production of highly nutritious, energetic and ready-to-serve soups. The production of flavours has also improved in the recent years. The major components responsible for the mushroom flavour are its alcohol, 1-octan-3-ol and other C_8 volatiles. A mushroom flavourant has been prepared by Kibler and co-workers by oxygenating an aqueous medium of homogenized mushrooms and

a water soluble salt of linolenic acid. Carob bean extract has also been used to further enhance the flavourant. Carriers and other additives may be used to protect the flavourant during spray drying (Kibler *et al.*, 1992). Currently, in India, monosodium glutamate (MSG) is being used as a flavour enhancer in commercial preparations of mushroom soup powders.

Consumption Patterns

Mushroom foods are enjoyed as a delicacy and its consumption is rapidly increasing as they have remarkable taste, flavour and nutritive value. Mushrooms, popularly regarded as vegetarian meat are now available in fresh, frozen, canned and dried forms. They are ideal for inclusion in both vegetarian and non- vegetarian diets. The diversification of mushrooms to various products for mass consumption is now met through the preparation of different mushroom foods like pickles, chutneys, ketchups, soups, chips, toasts, sweetmeats, mushroom snacks, mushroom chicken, butter and various other processed foods. These can serve well to the taste of the Indians. Various mushroom foods viz., mushroom *pulao*, stuffed omelette, pickle, *bujia, pakodas, samosas, paneer* and chicken curries are already popular in the cuisine of the big fast food chains and restaurants all over India. In the recent years, there has also been a marginal shift in the consumption of fresh mushrooms by institutional users like pizza parlours.

Fresh mushrooms contain virtually no fat and cholesterol and hence they can be consumed by patients suffering from atherosclerosis. It is also suitable for diabetes. As the crude fibre content is more, it can help in digestive problems such as constipation. It also provides very low energy and so can be used as a slimming diet. It supplies valuable proteins and all essential amino acids for growing children. In view of all the above reasons, consumption of mushroom foods is fast increasing.

Fresh mushrooms contain virtually no fat and cholesterol and hence they can be consumed by patients suffering from atherosclerosis.

Some industries are also consuming mushrooms to extract mushroom flavours, mycoprotein, proteolytic enzymes, extraction of some medicinal compounds, preparation of tonics, cosmetic products and health drinks (Kapoor, 1989 ; Chang and Miles, 1993 ; Chaudary, 1993). A recent review also discusses the production of mushrooms by submerged fermentation for food flavourings (Hadar and Dosortz, 1991). Currently, the trend is moving towards the development of mushroom nutraceuticals - a new class of compounds extractable from mushrooms which may be used in the prevention and treatment of various diseases and which can serve as dietary supplements to improve human health. Very recently, two Japanese companies, Garuda International and Maruzen Pharmaceuticals Co. have successfully produced extracts of two mushrooms - *Reishi* and *Shiitake* - for marketing them in tablet forms as speciality health foods (Perkin, 1994).

Some industries are also consuming mushrooms to extract mushroom flavours, mycoprotein, proteolytic enzymes, extraction of some medicinal compounds, preparation of tonics, cosmetic products and health drinks.

Present Status of Mushroom Industry in India

The cultivation of mushrooms is simple and more domestic. It is becoming a lucrative job among most enemployed youth, housewives and small and marginal farmers. They are converting the cultivation of this protein-rich commodity into a household activity or setting up a small scale mushroom enterprise. The government has already been playing a major role by introducing many schemes for the upliftment in the mushroom production. Recently, the Haryana government has introduced a scheme to boost the mushroom cultivation in the State (Anon, 1992). Even the APEDA, working under the Ministry of Commerce has a programme for providing incentives to private entrepreneurs engaged in mushroom cultivation.

As per the information available from the National Centre for Mushroom Research and Training (NCMRT), at Solan, the production cost of mushrooms is likely to be around Rs. 10 per kg. However, the same product fetches prices ranging

from Rs 60 to 70 in international market after processing. In India, the mushroom cultivation is becoming a viable method due to the combination of factors like suitable climate, supply of agricultural by-products and reasonable labour costs.

Mushroom cultivation is not possible round the year in a country, like India, because of its tropical climate. Moreover, the fungus grows best in the cold climate and the hilly regions are more suited for this. In the recent years, the availability of the controlled environment cultivation technology in the country, has provided a platform for the companies to launch the under controlled conditions has given a boost for setting up of several large scale integrated projects for export-oriented cultivation and processing. All the companies which are setting up the commercial units in different parts of the country are acquiring this state-of-the-art technology from various foreign firms and are mainly 100% export-oriented unit (EoUs). Table 3 lists some of the Indian companies having collaboration (technical/financial) with various foreign firms. All these companies are having a buyback arrangement from their foreign collaborator to market the produce overseas.

The cultivation of mushrooms has a great potential for the production of protein-rich quality food and for the recycling of cellulosic agro-residues and other wastes.

tively in the disposal of the cellulosic agro-wastes. The mushroom industry is fast growing to meet the demand of the foreign nations. However, its consumption in India is very limited.

Some important points needing emphasis for the improvement in the status of this industry in our country are -

Table 3. List of Some Indian Companies Collaborated with Foreign Firms for Mushroom Cultivation

Indian company	Foreign firm	Place of project/unit established
Indo-Britian Agro Farms Ltd.	Macon Agri Ltd., (Tyrone) UK	Jyotipur, Hissar
Agro-Dutch Foods Ltd.	Dalsem Veciap bc. Agro Industries, Holland	Tofapur village of Patiala dist., Punjab
Jain Group of Industries	Eldar Electronics, Israel	Jalgaon, Maharashtra
Moneshi, Agro-Foods Ltd.	South Star, Singapore	Guntur, Andhra Pradesh
South Asian Mushrooms Ltd.	Macon Agri Ltd., Northern Ireland	Umari Village of Raisen district, Madhya Pradesh
Sugam Agro-tech Ltd	Avi of Israel	Kakinada, Andhra Pradesh
Teg Marrado Agro-Farms Ltd.	Dalsem Veciap, Holland	Chail, Punjab

exports. In this new technique of cultivation, the humidity, temperature and air are carefully monitored to have optimum production and the availability of the produce throughout the year.

This indoor cultivation

Future Perspectives

The cultivation of mushrooms has a great potential for the production of protein-rich quality food and for the recycling of cellulosic agro-residues and other wastes. It is the only industry which contributes effec-

- to bring an overall awareness among the people about its rich and quality protein content.

- to provide training programmes for the transfer of the latest technology for mushroom cultivation.

- to open spawn centres for the supply of better quality spawn for mushroom growers.

- to improve the market sales through the opening of outlets for the purchase and sales of fresh mushrooms and the canned products.

- to popularize the mushroom utility through advertisements and also through cooking demonstrations.

Mushroom foods can serve to improve the nutritional status of Indians and help in alleviating protein deficiency in children.

Conclusions

From the foregoing discussion, it can be concluded that in the recent past, the world mushroom production has increased by seven fold. However, mushroom production does not demand land, but helps in the bioconversion of potential pollutants like agro-wastes to useful and nutritive food for human consumption which is essential to a developing country like India. Mushroom foods can serve to improve the nutritional status of Indians and help in alleviating protein deficiency in children. The inception of National Centre for Mushroom Research and Training (NCMRT) at Solan has really boosted the morale and stability of mushroom industry in India. Its active R&D and consultancy services are remarkable. Very recently, Solan has been considered as the mushroom city of India (Verma, 1995). In the near future, India with a lowest labour, requisite temperature, abundance of plant materials like straw can produce mushrooms at a much cheaper rate and can land itself in the international market in a big way.

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INTERESTING FOOD FACTS

- Consumers in the United Kingdom spend nearly 300 million pounds Sterling per year on mushrooms.
- Some types of seaweed contain more vitamin C than oranges.
- The cans of food produced during the early part of the nineteenth century could only be opened with a hammer and chisel.
- Nine types of stainless steel are in common use in the food industry.
- Approximately 4 percent of raw cow's milk is contaminated with *Listeria monocytogenes.*

- Selected -

Applications of Immobilized Enzymes and Cells in the Processing of Soymilk and Soyfoods

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Introduction

There has been voluminous use of enzymes in food and dairy industries in the past and 95% of food industries are working on enzyme-based processes (Roles and Thijssen, 1987) and number of excellent and extensive reviews are already available on the subject (Roels and Thijssen, 1987 ; Boopathy, 1994). However, soy-based food industries have not so far attracted the attention of biotechnologists/enzymologists. This is more relevant in the context of increasing production and consumption of soyfoods viz., soymilk/*paneer* etc., which are becoming very popular as low cost substitutes of traditional dairy products for common mass and as ideal nutritive supplements for lactose intolerants (Biranjan *et al.*, 1983). There are only few reports available on enzyme-based processes in soy food production. The present article not only identifies various areas of soybean processing especially soymilk/*paneer* production, using enzyme-based process, but it also focusses on the work so far done in these areas.

Application of Enzyme / Cell Technology in Soy Dairy

Following are some of the key areas which need the attention and where enzyme-based processes should be / are being applied to solve some of the key problems to get better results :

(i). Removal of flatulence factors and other antinutrients. (ii). Improvement of flavour/removal of beany flavour. (iii). Soymilk coagulation. (iv). Improvement of nutritional/physico-chemical properties and (v). By-product utilization.

Oligosacharides are extremely thermostable and hence survive all heat treatment during processing.

Removal of Flatulence Factor and Other Antinutrients

Soymilk is reported to have significant amounts of oligosaccharides (570 mg/100 ml), comprising mainly raffinose (113 mg/100 ml), stachyose (457/100 ml) and verbascose (traces). On ingestion, oligosaccharides present in soymilk, are passed as such to colon, where colonic bacteria ferment it to carbon dioxide and acid resulting in flatulence, bloated feeling, belching and diarrhoea in extreme cases (Rackis *et al.*,1970).

Oligosacharides are extremely thermostable and hence survive all heat treatment during processing. Various workers have successfully used -galactosidase, purified from different sources such as *Aspergillus oryzae* (Cruz and Park, 1982) *Aspergillus satoi* and *Mortiallea* (Thanankul *et al.*, 1976) to remove these flatulent oligosaccharides from soymilk.

However, none of these could be economically viable as in all these cases where soluble enzyme preparations were used which could not be reused. An attempt has been made in this laboratory, (i) to use *Aspergillus oryzae* cell as a whole (as source of enzyme, without purifying) and (ii) to use these cells in immobilized form in order to make it reusable, continuous and economically viable. Thus, *A. oryzae* cells entrapped in 2% agarose bead could hydrolyze 66% oligosaccharides in 8 hrs, when soymilk was incubated with these cells at 50^0C (Khare *et al.*, 1994a). The process holds promise to develop a continuous one in a glass column reactor, which may function more effectively to generate flatulence - free soymilk.

Removal of Phytic Acid

Phytic acid is considered as yet another anti-nutritional factor present in soymilk. This is known to bind bivalent metal ions Fe^{++}, Zn^{++}, Ca^{++} etc. of the food, thus reducing mineral bioavailability (Reddy *et al.*, 1982).

Phytic acid is again very heat stable not destroyed by any heat treatment during soymilk production.

There have been some attempts to remove phytate from soybean meal by non-specific methods such as soaking (36% removal) (DeBolandet *al.*, 1975) or by solid state fermentation (88.06% removal) (Jha, 1990). There is only one report on the use of crude wheat bran phytase to hydrolyze soybean meal phytic acid (Zhu *et al*, 1990). However, there is no report on the use of enzymes for removal of soymilk phytic acid (0.56% level) or from other soyfoods. Attempts were made to use purified wheat phytase for this purpose in this laboratory. Purified wheat phytase was entrapped in polyacrylamide gel. Entrapment imparted high thermal stability to the enzyme and it became stable upto 10 hr at 60^0C, whereas control free enzyme lost 38% of the activity under similar conditions. This immobilized enzyme hydrolyzed 78% of soymilk phytate, when incubated at 60^0C for 8 hr, whereas native enzyme hydrolyzed only 42%. (Khare *et al.*, 1994b). This immobilized preparation may form a basis for continuous reactor system for obtaining phytate-free soymilk.

Removal of Bean Flavour

The single largest factor restricting consumption of soymilk and some other soyfoods, is its beany flavour (Rackis *et al., 1979).* This off-flavour results from the hydroperoxides generated from lipoxygenase catalyzed oxidation of saturated fatty acids (Sessa, 1979).

None of the attempts, so far, have been able to completely inactivate lipoxygenase and sufficient residual off-flavour still persists to distract the consumers.

The single largest factor restricting consumption of soymilk and some other soyfoods, is its beany flavour.

Site directed mutagenesis of lipoxygenase so as to inactivate/making heat labile in the seeds, seemingly an appropriate approach, is yet to be tried.

Application of aldehyde dehydrogenase as a couple reaction to convert hydroperoxides (beany) into hydroperoxy acid (non-beany) has also been tried as yet another approach for obtaining non- beany soymilk (Sasaki *et al.*, 1982). However, this work is yet to be established into a viable process.

Soymilk Coagulation

Preliminary studies have been made to curdle soymilk by using proteases instead of chemical coagulants. However, detail functional, physico-chemical properties and acceptability studies will be required before any final word can be said in this regard.

Improvement of Nutritive and Physico-chemical Qualities of Soymilk

Soybean proteins are reported to be rich in lysine but deficient in sulphur containing amino acids especially methionine (Smith and Circle, 1972). In the past, chemical modification of proteins had led in improvement of amino acid score for some pulses and cereals (Wong and Wong, 1992). Similar approach is yet to be attempted in case of soybean/soymilk for obtaining a product with a balanced methionine content.

Similarly, protein modification such as succinylation and acylation may be attempted to improve physico-chemical properties and thus increasing acceptability of soyfoods as has been already reported in case of soyproteins (Feeney and Whitaker, 1982).

In yet another novel approach exploiting *Bacillus subtilis* as a rich source of proteases, protein hydrolyzate has been prepared from soybean meal using immobilized form of

the cells in our laboratory (Khare *et al.*, 1994c).

By-product Utilization

Three major by-products viz., Okara (1.1 kg./kg dry bean), soywhey (4-5 1/kg dry bean) in soymilk and soy*paneer* production and soyhull (10% db) in other soyfood production are usually obtained. Their disposal remains a bottleneck for soy-based food industries (Shurtleff and Aoyagi, 1979 ; van der Riet *et al.*, 1989). These are rich in complex sugars specially cellulose and hemicellulose and hence may be appropriately converted into high glucose syrups by using cellulase enzyme. Alternatively, if co-immobilized cellulase-glucoisomerase are used- a much demanded high fructose syrups may be produced. Studies have been initiated in our laboratory to optimize these conversion processes.

Fermentation processes have been widely used to convert various agro and food industry wastes into useful industrial products such as organic acids, amino acids, enzymes, vitamins and single cell proteins.

Fermentation processes have been widely used to convert various agro and food industry wastes into useful industrial products such as organic acids, amino acids, enzymes, vitamins and single cell proteins, (Blanch and Wilke, 1987 ; Vazquez *et al.*, 1993). Of late, these fermentation processes have been made more attractive by using immobilized microbial cells so that continuous processes are developed making a viable technology (Mausbach, 1988).

In case of soybean processing by-products utilization, continuous production of citric acid (27 g/l) from soywhey by using agarose entrapped *Aspergillus niger* cells has already been reported from our laboratory (Khare *et al.*, 1994d). Attempts are being made to scale up the process.

Also, solid state fermentation of okara has been successfully used to produce glucoamylase (633 IU/100g) and single cell protein (27%) using *Aspergillus terreus* (Khare *et al.*, 1994e). Citric acid, yet another industrial product could also be produced by mixed fermentation of okara, using *Aspergillus terreus* and *Aspergillus niger* (Khare *et at.*, 1994f).

Soyhull was also similarly utilized for the production of single cell protein and cellulase enzyme in our laboratory (Jha *et al.*, 1994).

In a different approach, soyhull could be proved as a good matrix which binds/eliminates trace heavy metals upto the extent of 90-95% (owing to adsorption property of cellulose) from synthetic solution passing through the column packed with soyhull powder. (Khare .*et al.*, 1993).

Conclusion

Biotechnology has many techniques and approaches to offer to uplift soymilk / soy*paneer* and soyfood production process, to improve their nutritive value,

Biotechnology has many techniques and approaches to offer to uplift soymilk / soy*paneer* and soyfood production process, to improve their nutritive value, acceptability and meaningful utilization of by-products of soyfood industries.

acceptability and meaningful utilization of by-products of soyfood industries. Nevertheless, there is a need to make vigorous and comprehensive studies on these aspects.

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Quest for Quality in Food Sector - Role of Standards

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Introduction

Food is the basic necessity of human being for survival and health. Its production and processing have been the traditional occupations of the countrymen from time immemorial, as is evident from the ancient mythological and historical literatures.Organized effort to boost production in pre-independence period was started by the then Government in 1871. Department of Agriculture was set up at central and provincial levels and various programmes were launched such as land reform, initiating irrigation projects, emphasis on research, education and marketing and creation of a Department of Food in 1942. In the planned post-independence period, evolution of revolutions in the form of green, white, blue, yellow and brown have ushered in an era of abundance of agricultural produce and animal products and have provided an impetus for rapid growth of hitherto stagnant food industry in the country.The cycle created by the enhanced agricultural production has proved to be mutually beneficial for producers and food processing industry. When viewed from the national scenario, this is a welcome change as India is predominantly a country of rural base.

Initially, as it is well known, the processing of food was done at cottage or community level. However, with the changing socio, cultural and economic scenario, there has been an apparent shift in the food habits, resulting in demand for highly processed foods involving sophisticated technology. A wide range of products such as canned products, both vegetative and animal origin, nutritious foods, fast foods, beverages and organic foods are being produced in the country and the industry has diversified tremendously in the past few decades. It can thus be seen that the food industry has its sound linkages from farm to factory level. Food processing industry in India is comprised of three groups viz. primary food processing, unorganized and cottage scale industries and processed food industries. The first group is made up of predominantly about 79000 rice hullers, 266000 flour *chakkis*, 10000 *dal* mills and 220000 oil mills. The unorganized sector is dominated by 54000 bakeries, 15000 traditional food units, 2000 *poha* making units and 5000 fruit, vegetable and spice processing units. There are about 18000 manufacturing units in the organized sector, producing a variety of food products valued at over Rs. 80 billion. Food processing industry ranks fifth in its contribution to value-addition, but tops in the list in terms of employment content with 1.2 million employed persons contributing 16.7% of the country's industrial labour. Further, this industry contributes 19% of the total number of manufacturing units, 13% of output and 6.4% of the value-added. In sharp contrast to other sectors, food industry accounts for only 5.2% of the total investment in industry in whole of the country.The most significant point is that food industry has a high employment potential with significantly lower investments. Food processing industry, thus,is an important segment of the industrial

The cycle created by the enhanced agricultural production has proved to be mutually beneficial for producers and food processing industry.

* Director

landscape of the country with high opportunity factors for its phenomenal growth during the coming years.

Initial Efforts

Efforts to regulate the food quality have been going on in the country right from 1899, when some provinces had made Rules for this purpose.Central Food Advisory Board established in 1937 and the Food Adulteration Committee set up in 1943 after reviewing the subject suggested for central legislation for bringing out uniformity in food quality laws and making it mandatory in the country. This resulted in enactment of Prevention of Food Adulteration Act 1954.

Government of India had enacted the Agricultural Produce Grading and Marking Act in 1937 for regulating grade standards for various agricultural produce. The Bureau of Indian Standards (earlier ISI) had initiated the work on storage of foodgrains and sugar in 1951. However, the work got a fillip from 1956 onward, when the Department of Food and Agriculture started functioning. Various statutory orders like *Fruit Products Order; Solvent Extracted Oils; Deoiled Meal and Edible Flour Control Order; Vegetable Oil Products Order; Meat Products Control Order under the Essential Commodities Act*, 1954 had been enforced from time to time for controlling the quality of various food items.

At global level too, emphasis was given for ensuring the food quality. In 1943, Founding UN Conference on Food and Agriculture which resulted in setting up of Food and Agriculture Organization (FAO) in 1945, suggested early action to assist in the improvement of standards applied to food and other agricultural products, including the standardization of the container and packages and to improve the inspection and enforcement. Later with the joint efforts of FAO and WHO, Codex Alimentarius Commission

Food processing industry in India is comprised of three groups viz. primary food processing, unorganized and cottage scale industries and processed food industries.

was set up in 1962 for setting of food standards. Emphasis was also laid in the UN sponsored Conference on Standardization in London in 1946 for formulation of the standards at global level on various agricultural and food products which resulted in

In the food sector, around 15 standards on terminologies relating to tobacco, spices, bakery, confectionery, food grains, nutrition, sensory evaluation, tea, coffee, cocoa, fish, meat and storage have been developed.

setting up of a Technical Committee immediately after the establishment of International Organization for Standardization (ISO) in 1947. In the field of dairy products, International Commission for Unifrom Methods of Sugar Analysis (ICUMSA) had already started the work.

BIS Efforts

Standardization plays a vital role in coordinating the efforts for integrated speedy development of industry in general and its equally true for food sector. Regarding standards *vis- a-vis* integrated development, it should be stressed that all national standards attempt to coordinate the requirements of three interests namely, producer, consumer and technologist. In the attempt for coordination, the Standards Organization like Bureau of Indian Standards, tried to secure the delicate balance amongst the three, ensuring that the standards are based on current state of scientific knowledge, permit production at economical level and serve the needs of consumers in general. The development and growth of this coordinated approach of standards is often a useful technical expertise for efficient mobilization of resources in the country.

Moreover, it has often been said that in a developing economy like ours specially when any industry, particularly food industry is to achieve a breakthrough in a short span of time, it is imperative to use all natural, organizational, technical and economic means in coordinated and integrated manner. This process of coordination is facilitated through an effective standards programme, specially when the programme is about to achieve the delicate balance mentioned earlier. In the background of above, a brief resume of work done by BIS on food sector highlighting areas and efforts, which have been fruitful and have moved hand-in hand with governmental policy and industries priorities and are

perhaps in right direction, are presented in this article.

Standards Formulation

The standards formulation can be grouped into two areas namely, horizontal and vertical. Horizontal areas are those which are of basic in nature and applicable in practically all aspects. Vertical areas are those which are specific to a product or group of similar products.

Horizontal Areas

Terminology

The basic purpose of preparation of standards on terminology is to provide an authentic definition of the related terms for uniform communication and facilitation of trade. In the food sector, around 15 standards on terminologies relating to tobacco, spices, bakery, confectionery, foodgrains, nutrition, sensory evaluation, tea, coffee, cocoa, fish, meat and storage have been developed.

Sampling

Standards on statistical sampling are relevant for drawing the appropriate number of samples for a lot for ascertaining the conformity or non-conformity to assist in accepting or rejecting lots by the purchaser, as 100 percent inspection or testing is neither feasible in every case nor desirable. Seeing the importance of the subject, about 30 standards have been brought out on various food products, like tobacco, food colours, spices, fruits and vegetables, fish, confectionery, bakery, foodgrains, various dairy products, stimulant foods and edible oils.

Method of Test/Analysis

Standards on methods of test/analysis are desirable to provide uniformity in testing various parameters as well as for the reproducibility and repeatability of the test results. Around 225 Indian Standards, covering practically all areas of testing of the food sector have been brought out. A Handbook of Food Analysis which is a consolidated publication on various methods of analysis of the food products in 15 parts (General; sugar and honey; starches and starch products; bakery and confectionery; protein-rich foods; spices and condiments; fruits and vegetables; stimulant foods; alcoholic drinks and carbonated beverages; dairy products; meat, fish and poultry; oils and fats; food colours and other miscellaneous products) has also been published.

Hygiene is a very important aspect for preparing and processing safe and sound food items.

Grading

Grading of the agricultural produce/product is a pre-requisite for value addition and also for giving better quality and products. About 25 standards have been brought out on grading of various oilseeds, coffee, cocoa and sugar.

Storage

Foodgrains and their products once produced are to be protected from spoilage till they are consumed. Therefore, scientific storage under controlled environment and conditions assume importance. About 45 standards have been brought out covering bulk, bagged and cold storage of various food commodities.

Hygiene

Hygiene is a very important aspect for preparing and processing safe and sound food items. Consumers do not have the available knowledge or means for determining the hygienic quality of the food they purchase. For the guidance of the industry, over 30 hygienic conditions to be followed in processing and selling of various food items have been developed. These include *inter-alia* meat and fish stalls, *pan* stalls, milk distribution, soft drink manufacturing units, ice cream units, hotels, restaurants and other food serving establishments, food and vegetable units, refrigerated drinking water stalls, etc.

Food Packaging

The various materials that are required to pack food items are : paper products, polyethylene, tin, glass, aluminium foil, hessian and timber. For rationalized growth of each of these industries and economy of these packing materials, it is necessary that standards are formulated so as to reduce the variety of grades and the number of their container sizes in respect of each material. It is obvious that these standards would help the manufacturers of packing materials to step up the productivity and this, in turn, would bring down the cost of packing materials.

A large number of Indian Standards have been published on paper packing materials like bitumen-laminated water-proof packaging paper, fibre board boxes and waxed paper for confectionery. Similarly, standards have been prepared on various food grade plastic materials. Standards in the field of tin containers are : rectangular tins, round vanaspati tins and crown corks. Regarding glass containers, standards have been formulated on crown cork type

aerated water glass bottles, glass milk bottles, glass containers for preserved food industry and glass liquor bottles. Aluminium foils for milk bottle caps have also been covered. Some of the standards on hessian are : A-Twill jute bags, B-Twill jute bags and hessian bags. For timber boxes, some of the standards published are : wooden packaging cases, plywood cases, battened construction, wooden boxes for packing of apples, plywood tea-chests and wooden crates. Generally, all these standards aim either to reduce the variety of container sizes or reduce the multiplicity of grades of packing materials.

Food Labelling

Food labelling is an essential component in all food processing industries. Its purpose is to inform the consumer, in an unambiguous manner of the contents of the food inside the package or container. There is much awareness among the consumers to know what a package contains and what they are paying for an unknown quality and quantity of the food in the package. This has led to the necessity of enumerating on the label the ingredients, the net content and other essential points about the food in the packages. It is equally important that the declarations and claims made in the label are true and reflect the product packed. An Indian Standard in three parts covering general guidelines, guidelines on claims and nutritional labelling had been brought out for the guidance of the industry and the consumers.

Food Advertising

Advertising is vital for successful marketing of food products. It provides an essential service to the consumer, to the industry and commerce, to the government and the economy in general. An Indian Standard has been brought out

Food labelling is an essential component in all food processing industries.

covering the code of practice for food advertising which deals with terminology, basic principles, rules of conduct, claims, special categories of advertising as well as rules for implementation. This code has been evolved keeping in view the role which advertising plays in ensuring the consumer's right to knowledge about the food products he buys, and the industry's problems in meeting the demands of market forces in the best way possible.

Food Additives

Food additive means any substance not normally

Food additive means any substance not normally consumed as a food by itself and not normally used as a typical ingredient of food, whether or not it has nutritive value.

consumed as a food by itself and not normally used as a typical ingredient of food, whether or not it has nutritive value. These are added intentionally in food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food, or may be reasonably expected to become a component of or otherwise, effecting the characteristics of such foods. Food additives which may be allowed in various foods are antioxidants (a substance which when added to food retards or prevents oxidative deterioration of food and does not include sugar, cereal oils, flours, herbs and spices.), emulsifying and stabilizing agents (substances which, when added to food, are capable of facilitating a uniform dispersion of oils and fats in aqueous media or *vice-versa* and/or stabilizing such emulsions), anticaking agents (coat the food particles, thus reducing their contact surfaces and preferentially absorb moisture) ; colouring matter (a substance either of natural origin or coaltar-based, meant for adding colour to the product) ; flavouring agents and related substances (include flavour substances, flavour extracts or flavour preparations, which are capable of imparting flavouring properties, namely, taste or odour or both to food) ; preservatives (a substance which when added to food, is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other decomposition of food) ; sequestering agents (substances which prevent adverse effects of metals catalyzing the oxidative breakdown of foods, forming chelates,; thus inhibiting decolourisation, off taste and rancidity); buffering agents which are used to counter acidic and alkaline, changes during storage or processing steps,thus improving the flavour and increasing the stability of foods.

Over 85 Indian Standards have been brought out on various food additives, which

are permitted under the *Prevention of Food Adulteration Act*. Ascorbyl palmitate, aspartame, polyglycerol ester of fatty acids, polyglycerol ester of interesterified ricinoleic acid, propylene glycol, glycerol ester of wood rosin (ester gums), malic acid have recently been incorporated in the list of the permitted additives for which also, Indian Standards have been brought out.

Food Irradiation

The concept of using ionizing radiations for food preservation is not a new one. A British patent for use of ionizing radiation to improve the keeping quality was issued in 1905, which stressed the remarkable advantage of irradiation over direct use of chemicals. The R &D work done at Bhabha Atomic Research Centre (BARC) for the past three decades has established the efficacy of irradiation process for the preservation of potatoes and onions (inhibition of sprouting), mangoes and bananas (delay in ripening), wheat and wheat products (insect disinfestation), fish, poultry and meat (reduction in spoilage of microflora and extension of shelf life), frozen sea foods (elimination of pathogens like *Salmonella*), spices (insect disinfestation and microbial decontamination), Presently, 36 countries have approved one or more food items processed by ionizing radiation for human consumption. A total of 40 items have been approved either unconditionally or on a restrictive basis for human consumption. Test marketing of irradiated foods has been initiated in a number of countries with successful results. Japan, which had suffered the agony of atomic explosion and radiation hazard was the first country to market successfully irradiated potatoes. Food irradiation is widely accepted by world bodies like FAO, World Health Organization, International Atomic Energy Agency, and major nations as an alternate technology for post-harvest preservation of foodstuffs. However,its acceptance by consumers, industry and trade is rather slow. This is one of the main constraints in introducing food irradiation in domestic or international trade. Major objections raised by the consumer organizations against food irradiation are the absence of detection methods for irradiated foods and a lack of regulatory measures to prevent the misuse of this technology. So far, no work has been done by way of laying Indian Standards, but guidelines developed by International Consultative Group on Food Irradiation are available. Once the irradiation process gets acceptance by consumers, efforts would be made to develop Indian Standards.

Presently, 36 countries have approved one or more food items processed by ionizing radiation for human consumption.

Vertical Areas

Equipment

Equipments are necessary means in processing of the food items and efforts have been made to prepare standards wherever needed. Over 80 Indian Standards have been brought out on the apiary; sugar machinery; grain sampling, dairy and slaughtering of animal for meat purpose. Standards on the components with the specific raw material and the dimensional details suiting to the intended use for interchangeability have been given priority.

Products

Vegetative Origin

Bakery and Confectionery : In this area, about 25 standards on bread, biscuits, cakes and confectionery items have been formulated in which care has been taken to see that undesirable matter such as ash, crude fibre, colouring matter are limited, as bakery and confectionery items are generally consumed in large amounts by the vulnerable section of the society, namely children.

Nutritious and Snack Food : Thirty five standards have been brought out on protein-rich flours, concentrates and isolates which are used for fortifying various food items such as biscuits, beverages and even flour (*Atta*), which is used in the home. These are made from various oilseeds such as groundnut, cottonseed, soya, sesame, sunflower and also from edible leaves. Standards have also been formulated on protein-rich foods and food supplements in which the basic raw material is flour. These products have also been fortified with vitamins and minerals. The basic criterion used in determining the level of fortification is that one feed should provide one-third (1/3) the Recommended Dietary Allowance (RDA) for the particular group for which the food is meant. Standards have been formulated on various ready mixes, ready-to- eat extruded foods, *chiwda*, roasted cashewnut and peanut kernels.

Stimulant Foods : Stimulant foods have been covered under three headings, namely, tea, coffee, cocoa and their products.

Fifteen standards on tea, soluble and roasted coffee and coffee chicory powder, drinking chocolate, cocoa and chocolate coatings have been prepared.

Drinks and Carbonated Beverages : About 15 standards have been formulated on alcoholic drinks, such as rum, gin, whiskies, brandies, beer, vodka, table wines and also on carbonated beverages. In alcoholic drinks, the basic points of consideration include alcohol content, esters, aldehydes, flavours and freedom from harmful impurities, whereas in carbonated beverages, the parameters include the minimum limit of carbonate, sugar content and limits of harmful impurities. Recently, a standard on mineral water has also been published.

Tobacco and Tobacco Products : Ten Standards on tobacco products like cigarettes, smoking mixtures, cigars, cheroots, bidis, snuff, chewing tobacco, hooka tobacco, cigarette filter as well as tendu leaf for production of the bidis has been formulated covering various quality parameters.

Oils and Oilseeds : As oils and fats are the basic ingredient of the Indian households, in order to prescribe the quality parameter, 60 Indian standards on all oils like linseed, castor, coconut, cottonseed, groundnut, rice bran, maize, palm, vanaspati, bakery shortening and margarine, etc. have been formulated.

Foodgrain and Starch Products : About 35 Indian standards on various foodgrains and starch products such as sago, arrowroot, *Maida, Suji, Atta, Besan, Papad,* malting barley, barley malt, *Isabgol*, etc, have been formulated,

Fruits and Vegetables : The fruit and vegetable sector is one of the major processed food industries in the country and 38 standards have been laid down in the area of canned and dehydrated fruits and vegetables, *chutneys*, pickles, syrups, squashes, juices, etc.

Spices and Condiments : Thirty four standards have been formulated on all spices available in India in raw, powdered and mixed forms. The standards on spices have been laid down from the point of view of adulteration, freedom from impurities and other parameters specific to the particular spices or condiment.

About 15 standards have been formulated on alcoholic drinks, such as rum, gin, whiskies, brandies, beer, vodka, table wines and also on carbonated beverages.

Sugar and Honey : Fifteen standards have been formulated on products, namely, plantation white sugar, sugar cubes, icing sugar, extracted honey, squeezed honey, etc.

Presence of Certification Mark known as 'Standard Mark' on a product is an assurance of conformity to the specifications.

Animal / Aqua Origin

Dairy Products : Thirty Indian standards on various dairy products like lactose, milk powder, condensed milk, casein, infant milk food, malted milk food, ice cream have been formulated. Standards on various indigenous products, such as *Khoa, Chhana, Gulab jamuns, Rasogulla, Shrikhand, Burfi, Dahi,* etc. have also been brought out.

Meat and Fish Products : About 75 standards on various meat and fish products like, pork, ham, dressed chicken, egg powder, mutton and goat meat canned in brine, pork sausages, chicken essence, frozen prawn/shrimps, dry salted catfish, frozen lobster tails, pomfret fresh, pomfret frozen, sheer fish frozen, tuna canned in curry, etc. have been formulated for the guidance of the industry.

Certification

Product Certification :

The real benefit of standard formulation is accrued to the consumer only if the product in conformity with the relevant standard authenticated by a third party is available in the market. In order to provide this service to the industry and the consumers, the Bureau is operating Product Certification Scheme, which is basically voluntary in nature and in certain cases where health and safety are involved, this has been made mandatory by the Government of India under various statutory provisions. Presence of Certification Mark known as 'Standard Mark' on a product is an assurance of conformity to the specifications. The conformity is ensured by regular surveillance of the licensee's performance by surprise inspections and testing of samples, drawn both from the factory and the market. Around 570 licensees have been granted on various food items covering both voluntary and mandatory. The mandatory certification relates to milk powder, condensed milk powder,

condensed milk, infant milk foods, infant formulae, milk-cereal-based weaning foods, vanaspati and various food colours and additives.

Quality System Certification

The world wide movement for quality management systems at the enterprise level as a prerequisite for building competitiveness in the world trade has had its impact in India. Its installation and certification provide a demonstrable and transparent system. BIS is a national agency authorized to operate Quality System Certification in India. The steps taken are a) Adoption of ISO 9000 series of standards as IS 14000 series of Standards, b) Aligned procedure of operation of Quality Systems Certification based on international criteria and is comparable to any other such systems being operated in the world, and c) Awards certificates to enterprises meeting the requirements of IS 14000/ISO 9000 series of standards. Surveillance is maintained by adequate audit system.

ECO Mark

The Government of India has instituted, in February 1991, a scheme be known as ECO Mark Scheme for labelling environment friendly products. This is administered by the Bureau of Indian Standards. The scheme provides for labelling of household and other consumer products, which meet certain environmental criteria along with quality requirements prescribed in relevant Indian Standards. Additional requirements for ECO Mark will now form part of the concerned Indian Standard for Certification. For a product to be eligible for the ECO Mark, the product shall conform to the relevant Indian Standard as well as additional requirements incorporated for ensuring environment friendly nature of the product. For this purpose, Mark is a combination of BIS Standard Mark (ISI) and the ECO Logo. The draft ECO-Mark criteria for the group of products like processed fruits and vegetables, infant foods, beverages, food additives, tea, coffee and edible oils have been notified by the Ministry of Environment and Forests. On the basis of these draft notification, an attempt has been made to incorporate those requirements in the relevant Indian Standards in these areas.

BIS is a national agency authorized to operate Quality System Certification in India.

Efforts of Other Bodies

In the food sector, besides BIS, other organizations are also engaged in formulating and implementing standards on voluntary and mandatory levels. Attempts are being made to harmonize the work of related bodies. Work being done by some other ministries are given below.

Ministry of Health and Family Welfare

Ministry of Health and Family Welfare through a Central Committee for Food Standards (CCFS) is engaged in preparation of minimum standards on all food items, which are mandatorily enforced under the Prevention of Food Adulteration Act. The Act makes provision for prevention of adulteration of food and lays down that no person shall manufacture for sale, store, sell or distribute any adulterated or mis-branded food or food which is not in accordance with the conditions of the licence or any article which contravenes the provision of the Act or Rules or any adulterant or article of food, the sale of which has been prohibited for the time being. The Act also provides that no such food shall be imported to India. The standards on various articles of food are specified in the Rules. These are of minimum quality level intended for ensuring safety in the consumption of these food items and for safeguarding against harmful impurities, adulteration, etc. Some of the Indian Standards on food colours, infant milk foods, etc., have been mandatory for BIS Certification under this Act.

Ministry of Food Processing

Ministry of Food Processing through Central fruit Products Advisory Committee is preparing standards on all fruits and vegetable products, sweetened aerated waters, vinegar and synthetic syrup. The manufacture and distribution of these items are regulated through Fruit Product Order, 1955 issued under essential commodities Act. Manufacture or relabelling of fruit and vegetable products can be carried out only after a valid licence is issued by a licencing officer in the Ministry, which empowers the licensee to put their Standard Mark on his products. The licence is issued only after the licencing officer is satisfied with regard to the quality of product, sanitation, personnel, machinery and equipment and work area requirements as specified in the schedule laid down in the Order.

Directorate of Marketing and Inspection (DMI)

The DMI enforces the Agricultural Produce (Grading and Marking) Act, 1937. Under this Act, Grade Standards are prescribed for agricultural and allied commodities which are known as Agmark Standards. Grading under the provisions of this Act is voluntary. Grading and standardization of agricultural commodities involves sorting the commodities according to their quality attributes (grading) followed by inspection to verify the correctness of grade assigned to the commodities (quality control) and is known as 'AGMARKING'. The certificate issued by DMI in this regard is called the certificate of Agmark grading. This is issued for notified agricultural and livestock commodities in respect of produce graded by authorized packers. DMI is also enforcing Meat and Meat Products Order issued under Essential Commodities Act.

Ministry of Civil Supplies, Consumer Affairs and Public Distribution

Ministry of Civil Supplies has laid down certain obligatory conditions for packed products with respect to their quantity declaration under Standards of Weights and Measures (Packaged Commodities) Rules, 1977.

The Directorate of Vanaspati, Vegetables Oils and Fats through Solvent Extracted Oils, De-oiled Meal and Edible Flour Control Order, 1967 prepares and implements standards on solvent extracted oils, deoiled meal, edible flours and vanaspati, etc.

International Efforts

At the International level, there are two organizations dealing with standardization work namely, International Organization for Standardization (ISO) and Codex Alimentarius Commission (CAC). BIS is the liaison organization for ISO and the Directorate-General of Health Services is the liaison organization for CAC.

Ministry of Food Processing through Central fruit Products Advisory Committee is preparing standards on all fruits and vegetable products, sweetened aerated waters, vinegar and synthetic syrup.

International Organization for Standardization (ISO)

Ultimate and highest goal of standardization effort is to achieve international accord on technical matters, which are related to the exchange of goods and services between the nations. It is at the International level that stadardization brings about technological advancement and understanding among the nations. Keeping this in view, India started taking an active part from the very beginning in the work of ISO. Ever since the creation of ISO in 1947, India has been taking a leading role in its activities. India's important position has been recognized by other member bodies, as is evident from its almost continuous membership of ISO Council. Stadardization work is carried out in ISO by a network of the technical committes, sub-committees and working groups. Each technical committee and sub-committee has a secretariat, which is held by one of the members having sufficient expertise and necessary infra -structural facilities for formulation of International standards. ISO member countries have the choice to be associated with the work of technical committes and sub-committees in two different capacities - Participating (P) or Observer (O). Participating (P) members have an obligation to participate actively in the technical work and to vote on questions referred to them, but Observer (O) members have no such obligation.

India has played a key role in organizing the ISO work on food side and is represented on various technical committees.

India has played a key role in organizing the ISO work on food side and is represented on various technical committees on Agricultural and Food Products (TC 34),Starches (TC 93), Tobacco (TC 126) and other sub-committees. India holds the Secretariat of ISO Sub-committee on Spices and Condiments. ISO has brought out about 480 standards in this area. Out of these, there are 236 subjects which have been covered by both ISO as well as well as BIS. Out of which 40 standards are identical, 106 are technically equivalent and 90 are not equivalent.

Codex Alimentarius Commission (CAC)

The FAO/WHO Codex Alimentarius Commission was established to implement the joint FAO/WHO Food Standards Programme. The purpose of this programme is to protect the health of the consumer and to ensure fair practices in food trade, to promote co-ordination of all food standards work undertaken by the International Organizations and to finalize standards and after their acceptance by various Governments to publish them in Codex Alimentarius. Central Committee for Food Standards in the Ministry of Health is the liaison point for this Commission in India. The Ministry has set up a National Codex Committee for co- ordination of the work and putting forth the views before the meetings of the Commission. BIS is the member of this committee and presents its view point on matters of its concern.

The CAC has brought out a number of standards in the area of processed food products, including processed and quick frozen fruits and vegetables, fruit juices, fats and oils, processed meat and poultry products, soups and broths, sugar, fish and fishery products, cocoa products and chocolate, fats and oils, food for special dietary uses, food additives, milk and milk products, cereals, pulses and legumes and dairy products, irradiated foods, hygienic codes, method of analysis, etc. On a study of the requirements laid down in the Indian Standards as also the Codex Standards, it has been observed that Codex has prescribed requirements for parameters important, chiefly from the health and safety points of view, whereas Indian Standards also lay down other quality parameters.

Increased demand for products satisfying the requirements of material standards would go a long way in the ultimate implementation or adoption of standards.

Conclusion

Standards formulation is a dynamic activity. The standards developed with the cooperation of many experts in the field are to be implemented in increasing measures in the manufacturing and purchase functions. Increased demand for products satisfying the requirements of material standards would go a long way in the ultimate implementation or adoption of standards. In this process, also the organized consumer and the general public have a great role to play.

NEW MACHINERY

Fermentation System

Forbes Marshall offers complete fermentation systems for laboratory and pilot plant scale developmental experimentation. The fermentors are specifically designed to suit a wide range of applications, such as culture (fungal, actinomycete, yeast or bacterial cultivation) ; physico-chemical cultivation conditions (aeration, agitation, temperature, pH, etc) ; and sterilisation technique (autoclaving or *in situ* sterilisation). The fermentors are available in toughened glass or stainless steel with top or bottom driven agitation system, as required. Features include special hollow baffles designed to provide adequate heat transfer while eliminating the need for cooling coils/jackets, and efficient agitation systems which provide extremely high rates of mass transfer, (i.e, oxygen transfer rate). A wide range of process control instrumentation can be incorporated, ranging from simple conventional to sophisticated DCS systems. Advanced features such as dedicated windows-based data management system, automatic medium sterilisation, and time-proportional control strategy are incorporated in the package as a standard feature. The fermentation project are carried out by a team of experienced fermentation process technologists. Also offered are solutions to typical fermentation process control problems, such as flow, level and volume measurement under sterile, foaming, viscous and sticky conditions.

For details write to :

Forbes Marshall

Biotechnology Group

Systems Division

A-34/35 MIDC Industrial Estate, 'H' Block, Pimpri, Pune - 411 018, Maharashtra.

Milk Weighing and Controlling System

Accura offers a sophisticated milk weighing system which is fully electronic and easy to operate. the system is water-proof, highly accurate, and features data storage facilities such as society purchase with society code number, weight totalising as per individual society code, invoicing possible different data storage viz., cow milk/buffalo milk, number of cans/time-data. Display is in kg/l.

For details write to :

Accura Systems

49 Asmita, JVDP, No. 3 Vile Parle (West), Bombay - 400 056.

Pneumatic Conveying System

VG Engineers Pvt Ltd offers various range of pneumatic conveying systems from 100 kg/hr to 10,000 kg/hr and distances ranging from 10 m to 500 m for chemical and process industries for conveying products like pharmaceuticals, dyes, intermediates, minerals, lime powder, plastics, fertilisers, grains, soap noodles, etc. These systems are highly energy efficient for unit weight of material transferred. The company also offers these systems with complete PLC based automation for different operations to suit requirements. These systems can be specifically designed for efficient transfer of materials to multipoints. Electronic batching, automation, etc can also be incorporated to suit specific needs. Special systems are introduced into the system to prevent moisture loss during conveying. The systems can also be built to effect drying during conveying by using hot air conveying.

For details write to :

VG Engineers Pvt Ltd

501 Gayatri Chambers, R. C. Dutt Road

Vadodara - 390 005, Gujarat.

Air Classifier

The Finex air classifier is a screenless separator classifying powders from 100 mesh (125 microns) to 1,000 mesh (10 microns). Based on fluid dynamics, the material to be separated enters the separator through the bottom inlet and is sucked upwards over the rotor guide which has an adjustable speed drive. The selector control wheel permits the operator to shift from one separation to another. Materials of pre-selected fineness are carried from the upper outlet duct into the cyclones. The classifier has a high output at lower HP for economical separation of fine powders from 100 microns to 10 microns. Capacity is 25-1000 kg/h. It can handle a range of materials like chemicals,

pharmaceuticals, cosmetics, plastic, cement, lime, pigments, fillers, ceramics, dyes, resins, insecticides, foods and flour.

For details write to :

Finex Sieves Pvt Ltd.

606 GIDC, Makarpura,
Vadodara- 390 010 Gujarat

Cheese Portioning Machines and Cutting Sets

Alpma Gmbh is manufacturing a variety of cheese portioning machines for semi-hard and soft cheeses. The cheese portioning machines are pneumatically operated. The hydraulically operating machines enable clean and uniform portioning of all hard cheese. The double manual operation of the machines provides complete protection against accident in the cutting process.

Alpma Gmbh also offers an extensive range of cutting sets for cutting cheese blocks. The cutting sets are manufactured individually taking into consideration in the desired portioning and the type of cheese to be cut. Depending on the character of the rind and the consistency of the cheese either wires or special vanadium steel knives are used. The easy and quick interchangeability of all cutting sets make it possible to portion a variety of different cheese types on the same machine.

For details write to :

Food & Pharma Specialities

22 D, Nizamuddin (East),

New Delhi - 110 013.

Tel : 4618226 / 4621913 / 4633615

Fax : 4620020.

Extrusion Lines for Food Processing

Automated, but simple, versatile and easy to operate, these turnkey extrusion lines can be designed to suit the requirements of small and large enterprises. The lines are intended for production of mass-consumption food items such as snacks, pellets for frying, pre-cooked flours, instant preparation cereals, soups and baby foods, texturised soyabean proteins, biscuits, animal feeds and packaging systems. The multipurpose line, which incorporates several units in one single plant, allows a variety of raw materials.

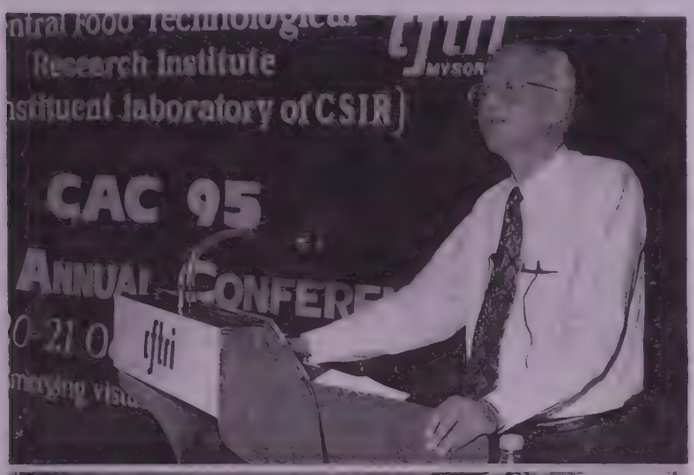
For details write to :

Inbramaq Industria Brasilelra de Maquinas

Avenida Presidente Kennedy 2000 - Lagoinha

CEP 14.095-220, Ribeiraa Petro-SP, Brazil

CFTRI HIGHLIGHTS



From top to Bottom :
Dr. R.A. Mashelkar, Director-General, C.S.I.R., New Delhi addressing CAC 95 delegates ; CFTRI Show Case inaugurated by Director-General ; Business meeting in progress

CAC 95 - A Real Success for CFTRI

The CAC-95', CFTRI Annual Conference - an unparalled meet between the captains of Indian Food Industries - large, medium and small scale - and CFTRI scientists got off to a flying start with the inauguration at Kalamandira, Mysore by Dr. R. A. Mashelkar, Director-General, C.S.I.R., New Delhi on 20th October 1995. Dr. G. Thyagarajan, Chairman and National Expert, NLDP and Chairman, Research Council, Central Food Technological Research Institute, Mysore, presided. Prof. M. M. Sharma, Director, UDCT, Bombay delivered the key note address. The focal theme of this year's conference was "Emerging Vistas for Partnership"

Over 350 industrialists participated. Representatives from Government organizations and promotional agencies also attended this 2-day meet. There were 30 live demonstrations of processes in action, 50 poster presentations and an exhibition of selected CFTRI technologies. Samples based on CFTRI's recent technologies were also on display.

A pamphlet describing the activities of CFTRI was brought out and sent to more than 1500 food industrialists. A souvenir with 25 invited papers was also brought out on the occasion. A computer programme was monitoring the registration and other activities of **CAC.** Over 160 Letters of Intent (LoI) were signed and there were more than 680 enquiries in various processes. The scientists of the Department of Technology Transfer and Monitoring were actively involved in co- odinating the proceedings of **CAC-95.**

The event culminated in a highly successful 20 parallel business meets with one-to-one interactions and discussions covering the areas of grain science and technology, enzyme and protein chemistry, fruits and vegetables technology, biotechnology, animal products, convenience foods, speciality/health foods, sensory science, fermented products, beverages, food engineering, packaging and human resource development programmes.

According to Dr. V. Prakash, Director, CFTRI, the business meetings resulted in a major thrust by the industries to enter into contract research and sponsored research in the above areas. At least 20 Memoranda of Understanding (MoUs) were signed and it is expected that another 40-50 business finalization will take place shortly. The meeting resulted in setting up a platform where such business strategies can be crystallized every year.

DATA BANK

Mushroom Cultivation Areas of India

Mushroom variety	Area
White Button Mushrooms	Punjab (Bhogpur, Tanda) Haryana (Gurgaon, Sonepet, Panipat) Uttar Pradesh (Foothills of Terai, Allahabad, Dehra Dun) Maharashtra (Pune) Tamil Nadu (Ooty, Madras) Kerala (Munnar Hills) Bihar (Bhagalpur, Ranchi)
Oyster and Paddy Straw Mushrooms	Tamil Nadu, Orissa, Kerala, Karnataka, Andhra Pradesh and Madhya Pradesh

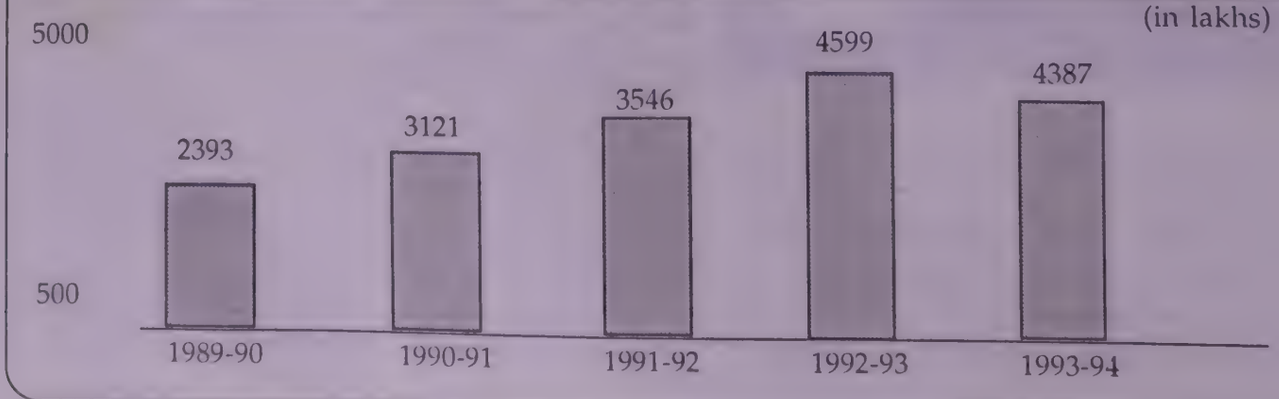
Production of Mushrooms

Year	Production (in tonnes)
1970-71	100
1975-76	400
1980-81	900
1990-91	7000
1992-93	15000

Problems of Mushroom Growers

- Low productivity
- High cost of production
- Labour unrest
- Inability to cope with global competition
- Low capacity utilisation of processing plant
- Uncertain domestic demand

Export of Mangoes



Monthly Average Wholesale Price and Total Arrival of Mandarin in Important Wholesale Markets (1994)

P-Price : Rs./qtl.
A-Arrivals : M.T.

Market	Month	Jan.	Feb.	Mar.	Apr.	May	Oct.	Nov.
Bangalore	P	990	632	795	1264	1778	-	632
	A	2898	7189	6120	2727	405	-	2385
Bhopal	P	677	46	454	646	-	-	622
	A	348	658	446	555	-	-	363
Bombay	P	800	502	473	634	-	-	408
	A	1830	3570	6880	3130	-	-	5740
Calcutta	P	800	700	648	646	882	842	763
	A	3060	4710	6800	3090	475	1340	6860
Delhi	P	992	716	815	1109	1400	108	1916
	A	11353	27591	42955	12856	344	10083	14410
Guwahati	P	723	1081	1264	1282	-	-	-
	A	116	43	57	168	-	-	-
Hyderabad	P	721	438	317	502	739	697	684
	A	626	1712	3448	2212	51	310	748
Jaipur	P	739	578	590	870	895	-	724
	A	233	2366	3507	1149	104	-	98
Jalandhar	P	806	703	805	1015	-	819	785
	A	382	472	600	470	-	784	1589
Madras	P	861	430	406	512	-	-	425
	A	931	1334	1485	734	-	-	503
Nagpur	P	578	448	398	555	-	450	459
	A	1832	3800	3344	499	-	995	1440
Vijayawada	P	546	404	371	-	-	344	415
	A	1149	51044	5335	-	-	1873	1550
Jammu	P	923	906	962	1028	1204	1417	-
	A	1073	1080	1135	905	288	100	-
Pune	P	750	583	583	833	1516	937	770
	A	462	883	1282	318	58	216	234
Madurai	P	579	621	646	-	-	580	624
	A	412	309	493	-	-	320	197

Source : Horticulture information service

Monthly Average Wholesale Price and Total Arrival of Lemon in Important Wholesale Markets (1994)

P - Price : Rs./qtl.
A - Arrivals : M.T.

Market	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.
Ahmedabad	P	477	527	560	1121	1144	559	312	149	239	430	378
	A	234	211	191	137	165	322	284	348	428	324	240
Bangalore	P	420	490	528	705	830	500	324	474	956	686	315
	A	937	1229	1139	800	1159	622	450	640	474	789	780
Bombay	P	402	518	652	901	1195	772	392	325	580	605	432
	A	1800	1540	1480	1300	1560	1920	2360	1750	1610	1880	2260
Calcutta	P	422	559	762	1081	802	754	663	956	1076	902	824
	A	1140	1005	1160	965	1280	1080	1160	640	465	865	1490
Delhi	P	533	616	654	1252	1612	976	477	522	581	771	711
	A	2041	2574	2876	3087	4709	7292	5884	5805	3284	2168	1334
Jaipur	P	519	597	560	920	1110	685	400	343	656	804	520
	A	139	142	157	144	433	570	803	737	159	166	350
Jalandhar	P	483	672	694	1210	1340	843	484	406	498	680	613
	A	120	119	141	113	130	352	574	1056	1344	557	684
Madras	P	417	496	592	1058	811	533	404	738	1262	804	546
	A	1176	1394	1800	1205	1167	1193	1340	1055	985	1140	1101
Nagpur	P	453	608	740	788	968	761	348	545	545	576	480
	A	262	196	196	142	157	178	264	175	165	210	229
Trivandrum	P	704	693	674	1440	2271	1238	965	1060	2076	1517	1336
	A	347	2263	61	220	201	290	359	269	113	173	224
Vijayawada	P	452	458	610	744	1097	1024	675	629	697	731	763
	A	116	108	110	119	148	141	114	123	136	113	135
Pune	P	666	958	1062	1180	1862	958	425	580	1176	1162	858
	A	729	491	508	348	234	486	913	668	262	306	432
Surat	P	391	596	619	900	1225	725	436	246	394	506	444
	A	364	168	192	131	113	354	453	561	286	602	348
Madurai	P	505	566	560	742	888	910	464	742	775	500	542
	A	425	407	398	294	252	206	417	278	308	314	333

Sources : Horticulture information service.

Production of Honey from Major Sources by Different States

Name of State	Production of Honey in Tonnes (Approx)	Sources
Andhra Pradesh	150	Citrus, Coriander, Niger Soapnut, Mixed Forest.
Assam	388	Citrus, Mustard & Mixed Forest Honey
Bihar	207	Karanj, Litchi, Mustard, Eucalyptus & Kasani.
Gurajat	100	Babul, Sunflower & Wild Weeds
Haryana	108	Mustard, Eucalyptus & Berseem
Himachal Pradesh	70	Sula, Litchi, & Jamun
Jammu & Kashmir	54	Eucalyptus & Sula
Karnataka	582	Coffee, Jamun, Rubber tree, Soapnut Mixed Forest Honey, Coriander, Cocopalm, Ber, Niger & Tamarind
Kerala	1963	Rubber Tree, Coffee & Cocopalm
Madhya Pradesh	90	Mixed Forest Honey, Niger, Mustard & Sunflower
Maharashtra	835	Jamun, Hirda, Pisa, Ber, Sunflower, Karvi & Coriander
Manipur	105	Mixed Forest Honey
Orissa	598	Mustard, Niger, Soapnut, Cashewnut & Mixed Forest Honey
Punjab	107	Mustard, Citrus, Litchi, Eucalyptus & Ber
Tamil Nadu	2373	Tamarind, Rubber Tree, Soapnut, Cocopalm & Wild Flora
Uttar Pradesh	105	Mustard, Litchi, Kasani, Eucalyptus & Jamun
West Bengal	500	Forest Honey, Cashewnut, Mustard & Litchi.

Source : Khadi Gramodyod (K.V.I.C.)

TRADE FAIRS & GET-TOGETHERS

Silver Jubilee Seminar on "Market Development for Agro-based Food Products", (February 9-10, 1996)

Association of Food Scientists and Technologists (India), Bombay chapter is organizing a seminar on "Market Development for Agro-based Food Products", as a part of its silver jubilee celebrations on February 9-10, 1996 at the Food and Fermentation Department, University Department of Chemical Technology, Matunga, Bombay - 400 019.

The seminar will bring together marketing experts, food technologists and industrialists to discuss issues such as market development for both export and local markets, for primary processed foods using newer technologies, innovating processing methods for traditional foods and opportunities for technology development for processing horticultural produce, particularly for the rural sector.

A Souvenir containing historical documentation of the activities of Bombay chapter as well as names of eminent personalities who have contributed to the growth of the chapter along with a few articles on issues relating to the growth of Indian Food Industry will be brought out on the occasion of the seminar.

For further details, please contact

Dr. Rekha Singhal

Hon. Secretary, AFST(I), Bombay chapter
Food & Fermentation Department
University Department of Chemical Technology
Matunga, Bombay - 400 019.
Phone 4145616, Fax : 4145614

National Conference on Food Quality and Consumer Protection in the New Industrial Economic Scenario"

(January 19-20, 1996)

Association of Food Scientists and Technologists (India), Calcutta chapter and the Department of Food Technology and Biochemical Engineering are jointly organizing a National Conference on "Food Quality and Consumer Protection in the New Industrial Economic Scenario" on 19th and 20th January 1996 in Calcutta in collaboration with the Small Industries Service Institute, Government of India, Calcutta.

There will be technical sessions on the following aspects:

1 National and International Standards of Food Quality : Problems of Alignment and Application.
2. National Efforts for Consumer Protection : Price, Nutrition, Labelling and Safety.
3. Laboratory Control and Hazard Analysis : Pesticides, Packaging Metals and Others.
4. Organization and Technology Upgradation in Food Processing Industries.

An exhibition on techno-economic processed, demonstration of plant, machinery & equipment and quality products will also held concurrently.

All communications may kindly be addressed to

Dr. Utpal Raychandhuri
Convenor - Organizing Committee
(Food Con-96)
Department of Food Technology and Biochemical Engineering
Jadavpur University
Calcutta - 700 032.

FICCI Trade Shows

Federation of Indian Chambers of Commerce and Industry (FICCI) is organizing three international events in India and South Africa called 'MantecH & TradEX' respectively. TradEX-96 International trade shows, focussing on the latest and upcoming fields of business and trade interests, will be held in India and abroad. MantecH '96 will highlight product and

product related technology, concentrating on new products and emerging technologies. This show is scheduled to be held once every two years.

The second 'India Intechmart' - the international buyer seller meet being organized jointly by the Ministry of Industry, Government of India and United Nations International Development Organization (UNIDO) will also feature as an integral part of TradEX'96 to be held during February '96 in Pragati Maidan, New Delhi.

Interested exhibitors may contact Mr. Nilay Kumar, Exhibition Secretariat, FICCI for further queries, (Fax-011-3320714, 3721504, Tele : 011-3319251, Tlx : 031-62521)

The calender of events is given below :

TradEx'96 : 17-20 February 1996 -Pragati Maidan, New Delhi.

MantecH'96 : December 1996 - Pragati Maidan, New Delhi.

TradEx'97 : 20-25 September 1997 - Kyalami Exhibition Centre, Johannesburg, South Africa

Interpack 96

The 14th International Fair for packaging machinery, packaging materials and confectionery machinery - INTERPACK '96, will be held in Dusseldorf from May 9-15, 1996. A programme of ancillary events is also being planned.

Details may be had from

MESSE DUSSELDORF

Dusseldorf

Messegessllschaft mbH

NOWEA-Postfach 10 1006

D-4000 Dusseldorf

Stockumer KirchstraBe 61

D-40474 Dusseldorf

Tel : (0211) 4560-01

Telfax : (0211) 4560-668

Tokyo Pack '96

The 1996 Tokyo International Exhibition, Tokyoi Pack '96 will be held from October 3-7, 1996. The event organized by the Japan Packaging Institute, will focus on the theme of "A Better Cleaner Environment through Packaging Technology".

Exhibits at Tokyo Pack will be divided into the following categories ; (1) Packaging Material, (2) Packaging Machinery, (3) Converting Machinery, (4) Food Processing Machinery, (5) Packaging Related Machinery and (6) Overseas Exhibits.

A total of 3000 booths by 5000 corporations are being planned.

Details may be had from :

Tokyo Pack 96 Secretariat

C/o. Japan Packaging Institute

Togeki Bldg., 4-1-1, Tsukiji,

Chuo-ku, Tokyo 104, Japan,

Tel : (int) 81-3-3543-1189

Fax : (int) 81-3-3543-8970

Corrugated 98

Corrugated 98 will be held from Thursday 4 June to Tuesday 9 June 1998. Companies interested in exhibiting can contact :

Jane Harris

Tel : +44 (0) 121 711 3953.

Fax : +44 (0)121 711 4993

Corrugated 98 is organized by :

Reed Exhibition Companies (UK)

Oriel House,

26 The Quadrant

Richmond.

Surrey TW9 1 DL, UK

Tel : +44 (0) 181 910 7910

Fax : +44 (0) 181 910 2717

Anuga 95, Cologne

(30, September - 5 October 1995)

Anuga-World Food Fair under the aegis of ITPO, India was conduced recently at Cologne, Germany, Over 40 participants included the various Export Promotion Councils viz., Agricultural Products and Processed Food Export Development Authority (APEDA), Coffee Board, Tea Board, Cashew Promotion Council and Spices Board.

APEDA organized an Indian Seminar presided over by Mr. S. K. Lambah - Indian Ambassador in Germany. It was well attended by over 100 companies as well as by Mr. C. K. Basu, Joint Secretary, Ministry of Food Processing Industries, Government of India. Top officials from the food processing industry from Himachal Pradesh and Uttar Pradesh were also present and gave presentation on the advantages in investing in their respective States for increasing the production of food processing items.

On the whole, the exhibitors saw ANUGA as a platform to exhibit their goods, make new contacts, renew old contacts and view ANUGA as a springboard to success in exports to the world market.

BOOKS

Proceedings of the XIXth International Congress of Refrigeration, The Hague - 1995

The proceedings of the XIXth International Congress of Refrigeration held in the Hague during August 1995, present the latest scientific works in refrigeration and its applications. They consist of 487 selected papers in English or French. These proceedings are part of the IIR series 'Progress in Refrigeration Science and Technology" and are divided into 6 volumes, addressing 4 main topics.

Volume I - Health, Food, Drinks and Flowers (416 pages and 55 papers)

Volume II - Storage, Transport and Distribution (772 pages and 98 papers)

Volumes IIIa + IIIb - Equipment and Processes (1286 pages and 167 papers)

Volume IVa + IVb - Energy, Working Substances and Environment (1360 pages and 167 papers)

Price :

Complete Set	US $ 300/-
Vol I or Vol II	US $ 80/-
Vol IIIa + IIIb	US $ 120/-
Vol IVa + IVb	US $ 120/-

(+ postage and handling)
15% discount for Association Members of the IIR.

Enquiries to :
Director
International Institute of Refrigeration
177, bd Malesherbes/F 75017
Paris (France)
Tel : (33.1) 42273235 ; Fax (33.1) 47631798

A Guide to the British Food Manufacturing Industry

(pp 392 : Price £ 65/-)

This important book, now in its fourth edition, provides vital information on food companies engaged in food manufacturing in the UK in a user-friendly and easily assimilated way. All major UK food companies are included, and information about companies and the products they supply is given in several useful ways, for example by size of company or products produced. Full alphabetical listings of names and addresses are also given, together with details of recent acquisitions, disposals or mergers, and further information sources, detailing trade, research, government and educational establishments, are included. The huge wealth of detail given in this book means that it will be an invaluable information source for all those marketing in and to the food industry and for food scientists, food technologists, ingredient and equipment suppliers and libraries within industry and academia. The book should appear on the shelves of all those who are in irregular contact with members of the food industry ; company directors, in particular, will find it to be of great value.

Enquiries to : Chapman & Hall, 2-6, Boundary Row, London, SEI 8 HN, U.K.
Telephone : 0171-8650066 ; Fax : 0171-5229623
Indian Representative : Shri R. Seshadri, Chapman & Hall
32, Second Main Road
C.I.T. East
Madras - 600 035.

Directory of Biotechnology Industries and Institutions in India (1994-95)

This databank covers the profile of more than 360 companies, research institutions, university departments and equipment suppliers involved in the field of biotechnology. In this edition, the company profiles include, addresses, branches, contact persons, nature of activities, new projects, legal status, apart from capital employed, manpower, turnover and import/export data for the last three years. The Directory is organized into three parts - Part A : Research Institution and University Departments, Part B : Biotechnology Companies and Part C : Equipment Suppliers.

ISBN 81-85939-00-4

Price : Rs. 1500/US$ 150/-

Continued on page 74

AWARDS

Dr. P. Narasimham, a scientist working in the Fruit and Vegetable Technology Department of Central Food Technological Research Institute has been honoured with "Twentieth Century Achievement Award" by the Board of Directors of the American Biographical Institute, USA, in recognition of his admirable career achieve ments and social contributions and has been selected for perma nent documentation in "Five Hundred Leaders of Influence' de signed for biographical reference and inspiration for citizens of the Twentieth Century as well as future generations.

Dr. Narasimham, during his 35 years career as a research scientist had led several projects and trained teams of scien tists for the R & D work, which helped in evolving effective solutions to several problems in the post-harvest handling, storage and processing of both tropical and temperate fruits and vegetables. These technologies can be applied both in the rural and urban areas, in the storage of fresh horticultural produce, and in the processing and marketing of the same. Dr. Narasimham has guided over 15 research scholars for their Ph.D/M.Sc. degrees of Mysore University thus contributing to the human resources developments in the country.

Dr. Narasimham, alone and also along with his colleagues, pub lished more than hundred research papers in several national and International scientific journals, besides contributing by invi tation, chapters/articles in the publications brought out by International Publishers such as Academic Press, UK and Florida Science Source Inc. USA. He has also to his credit a couple of patents in Food Processing and a few processes released to indus try.

Dr. Narasimham has received several awards and distinctions from National and International Institutions for his work on apples, (AIFPA award 1984) banana, breadfruit, grapes, (AIFPA award 1988) jack fruit, mango, orange, onion, potato etc. He was invited by International Potato Center, Lima, Peru, to participate in the 2nd Asian Potato Conference 1988 (China) and 3rd Asian Potato Conference 1991 (Indonesia) and represented India in the Vth session of CODEX Alimentarius organized by FAO/WHO at Mexico City during September 5-9, 1994 to evolve quality standards for the export of fresh fruits and vegetables.

More recently (March 1995) the research work on post-harvest handling and storage of onions carried out under his guidance earned one of his Ph.D students, the ICAR Jawaharlal Nehru award in Horticulture. Dr. Narasimham was President of the Association of Food Scientists and Technologists (India) for the year 1994-95 and had been responsible for organizing the most successful Indian Convention of Food Scientists & Technologists (ICFoST-95) on the theme "Food Engineering - recent trends and developments".

Presently, Dr. Narasimham is the Principal Investigator of a project sponsored by the Ministry of Food Processing Industries to evolve modified atmosphere packaging technologies for minimal ly processed vegetables" in "ready-to-cook" and "ready-to-eat" forms.

ADVERTISERS' INDEX

AFST(I) NEWS

Headquarters

Annual General Body Meeting (1994-95)

The Annual General Body Meeting of the Association for the year 1994-95 was held on 9th September 1995 at 5-30 p.m. in the IFTTC - Auditorium, CFTRI Campus, Mysore under the chairmanship of Dr. P. Narasimham, the outgoing President. The chairman welcomed the members and conducted the proceedings. The Secretary, Dr. K. Udaya Sankar read out the annual report, highlighting the activities of the Association during the year 1994-95. According to the report , the membership position of the Association stood at 2400 as on 31st March 1994. About 750 new members were enrolled in various categories during the year, making the total number of members to 3150. The Central Executive Committee met 7 times during the year. The following 2 important committees viz., (i) Credential Committee with Mr A. Ramesh, as Chairman, Dr. K. Vidyasagar, as Member and Dr K. Udaya Sankar, as convener and (ii) Finance Committee with Sri C. P. Natarajan as Chairman, Dr K. Udaya Sankar as Member and Dr M. S. Krishna Prakash as convener were constituted for the year 1994-95. The Credential Committee met 4 times during the year and admitted 750 new members in various categories to the Association.

The Finance Committee met 3 times and monitored the financial management of the Association. Taking into consideration, the unprecednted escalation of the costs of newsprint and other raw materials and subsequent increase in the bills for the printing of both the journals, stationery for the office, postage and wages, the finance committee has suggested the following revision in the membership fee for the various categories.

Life Corporate member	Rs. 20,000/-
Corporate member	Rs. 2005/-
Life member	Rs. 2000/-
Regular member	Rs. 205/-
Affiliate member	Rs. 255/-
Student member	Rs. 155/-

IFCON-93 proceedings

Secretary felt sorry for not being able to bring out the Proceedings of IFCON-93 on time due to some unavoidable technical problems and promised that every effort will be made to bring out the proceedings very soon. Efforts are being made to bring out the directory of members of AFST(I) for the year ending 31st March 1995 and this will be distributed to members at no profit no loss basis.

Action is being taken to prepare new life membership cards and the same will be issued to the members who are enrolled as life members from 1-4-1994 to 31-3-1995. Those members who have not received the life membership cards may contact the Secretary so that their names could also be included in the revised list.

Treasurer's Report

Dr M. S. Krishna Prakash, Hon. Treasurer, AFST(I) presented the Treasurer's Report, audited statement of accounts and the budget proposal for the year 1995-96 for the General Body's consideration. The General Body agreed to continue with the services of the previous auditors for the coming year.

Chapter Activities

The reports received from the Chapters about the activities conducted by them during this year are as follows :

Bangalore chapter held a one day seminar on 'Product opportunities in Food Industries' on 10th June 1995.

Bhopal chapter conducted a one day seminar on 'Prospects of food industries in Madhya Pradesh' on May 5, 1994, at Bhopal.

Calcutta chapter organized a National Conference of "Total quality management in food, fermentation and allied industries' on January 20-21, 1995.

Delhi chapter organized ICFoST-94 on 'Strategies for packaging and storage of fresh & processed fruit & vegetables in 21 century on 2-3 September, 1994, at India International Centre, New Delhi.

Hyderabad chapter celebrated World Food Day on 16-10-94 and also organized three symposia on

(i) National Water Policy

(ii) Vector biology and

(iii) Integrated on-farm and off-farm employment, from 19-21, January, 1995.

Jabalpur chapter celebrated 'Founder's day on Monday, the 19th September, 1994, at JNKVV, Jabalpur.

Ludhiana chapter organized a 2 day workshop-cum-training on 'Speciality bakery products' on 3th and 31st January, 1995. Two awards (i) Nestle Food Scientists of the year 1994 and (ii) Thapar Food manager of the year 1994 sponsored by Thapar Ispat Ltd., Ludhiana were presented.

Pune chapter celebrated the "Founder's Day' on Monday, the 16th September, 1994, at the MS institute of Hotel Management and Catering Technology, Pune.

AFST(I) Education & Publication Trust

The AFST(I) Education & Publication Trust met 4 times during the year. In the third meeting held on 7th April, 1995, the Trustees decided to bring out a publication on ISO-9000/HACCP certification for Food Industry with the following aspects :

1. Thermal processing - by Dr. S. Ranganna

2. Sanitary conditions in Food Industries and HACCP - by Sri. C. T. Dwarakanath

3. ISO 9000 certification for Food Industry - What is to be done ?
- by Dr. M. N. Krishnamurthy.

The publications are under preparation and will be brought out shortly.

AFST(I) Education & Publication Trust has already instituted two Gold Medals for meritorious students from Mysore and Bombay Universities.

Action is being taken to institute one more Gold Medal from AFST(I) Education & Publication Trust, in the Jadavpur University. This will be materialized during the year 1995-96, bringing the total number of AFST(I) awards to 3. There is also a proposal to institute a Gold Medal for B.Tech (Agri Food Engg.) by IIT, Kharagpur and this will be considered by the CEC.

Various universities who are teaching Food Technology as a major subject, have been contacted for award of AFST(I) Educational & Publication Trust scholarships to meritorious students, who are in the first year and second year of Food Science/Food Technology. After getting nominations from the university, further action will be taken to grant scholarships for 2 first year students and 2 second year students.

Publication of Journals

Journal of Food Science and Technology

This journal has entered its 32nd year of publication and has gained international status. The journal has got over 200 Indian subscribers and 75 foreign subscribers. Dr. B. K. Lonsane, the Editor, JFST and the editorial board members are rendering excellent service to the journal. Number of copies of JFST printed per issue each year are 2000 . CEC has approved to extended the services of Dr. B. K. Lonsane as Editor of JFST for one more term, in view of his excellent work and vast appreciation of his stewardship as Editor received from a number of members both from Indian and abroad.

Indian Food Industry

This journal has entered its 14th year of its publication. The journal has got 367 Indian subscribers and 3 foreign subscribers. IFI at present is standing on its own with increased advertisements and subscription. Mr. S. P. Pillai, Chief Editor and the Editorial Board are rendering untiring services to the journal. Number copies printed per issue each year are 2200.

New Office-bearers of the Association for the year 1995-1996.

Dr. K.S. Manja, Scientist, DFRL was appointed as Returning Officer to conduct the elections of office-bearers for the year 1995-96. Election notices were issued on 18 - 7 - 95. The total number of ballot papers received were 987 and all of them were found valid. The election formalities were completed on 23-8- 1995.

The following members were declared elected as new office bearers for the year 1995-96

Dr. C. L. Nagarsekar - President - Designate

Dr. M. N. Krishnamurthy - Vice-President (H.Q.)

Dr. M. S. Krishna Prakash - Jt. Secretary

Mr. C. T. Murthy - Hon. Treasurer

The New Central Executive Committee (CEC) will form the following office bearers along with the newly elected office bearers.

President -
Dr (Mrs.) Rugmini Sankaran

Imm. Past President -
Dr. P. Narsimham

Vice-Presidents (Chapters)
Mr. A. Devariya (Bangalore)
Dr. A. S. Gholap (Bombay)
Dr. J. Chakraborthy (Calcutta)
Dr S. K. Mittal (Pantnagar)

Hon. Exec. Secretary -
Mr. P. C. S. Nambiar

Imm. Past Secretary -
Dr. K. Udya Sankar
Editor JFST -
Dr. B. K. Lonsane
Chief Editor IFI -
Mr. S. P. Pillai

Induction of President - Designate as President

Dr. P. Narasimham, the outgoing President invited Dr. Rugmini Sankaran, the incoming President to the dais and requested to take over the charge as President for the year 1995-96.

In her presidential remarks, she placed on record the excellent co-operation the AFST(I) has with CFTRI and DFRL and wished that the same co operation shall continue in future also. She mentioned the need for the Association to work as an institution to interact with government in policy matters. She felt that there is an urgent need to have a thrust on food laws and food safety.

The meeting ended with a vote of thanks to the chair and to all the members.

Bhopal Chapter

On the occasion of 'World Food Day', the Bhopal Chapter of Association of Food Scientists and Technologists (India) organized a Special Lecture on October. 16, 1995, at 5 PM at MLB College, Bhopal. Dr. S. D. Kulkarni, Hon. Secretary welcomed the guests, speakers and participants, Dr. Nawab Ali, President introduced the theme of function and the guests.

Dr. (Mrs.) Madhu Mishra, Head, Department of Home Science, MLB College, Bhopal was the lead speaker and delivered a talk on "Food and Mankind - A Multi-dimensional Approach". She stressed the need for renewed efforts for making good quality food to the needy for proper physical development. Dr. M. N. Kulkarni, Chief Guest of the function and State Representative, UNICEF presided over the function and drew the attention to 'Maternal Malnutrition' and indicated to strive for 'Nutritional revolution'. Dr. (Mrs.) S. Ramachandran, Special Guest and Principal, MLB College, Bhopal sought the seriousness in food preparations *vis-a-vis* quality of raw material, cleanliness of utensils and hygiene for better results. Dr. S. D. Kulkarni, Hon. Secretary proposed vote of thanks.

BOOKS ..... Continued from page 70

Directory of Resource Persons in Biotechnology

Information on over 350 experts are included in this Directory, whose profiles include their addresses, qualifications, professional training, specialization, projects handled, work published, awards received, etc. All the major areas in biotechnology like agriculture, medical and health care, environment, speciality chemicals and biotechnology equipments are covered.

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Nominations Invited for Fellows of AFST(I) for 1995

The AFST(I) has pleasure in inviting nominations from persons to be conferred as "Fellow of Association of Food Scientists and Technologists (India)". The title (FAFST) is conferred to honour those who have contributed significantly to the progress of Food Science and Technology.

General

1. The awardee will be called as Fellow of Association of Food Scientists and Technologists (India) and an abbreviated form will be termed as FAFST.

2. The total number of Fellows of the Association will not exceed 5% of total membership including regular and life members of the Association in any given year or 100, whichever is lower.

The title of Fellows has so far been awarded to 36 AFST(I) members and 6 non-members who have contributed to the progress of Food Science and Technology.

Eligibility

1. The aim is to honour persons of outstanding merit who have contributed significantly in the field of Food Science and Technology including R & D Product/ Project Development, Industry, Transfer of Technology and Marketing. The merit of contribution should be the main criterion.

2. Among the Fellows to be nominated every year, 70% will be from AFST(I) and remaining 30% may be from non-members who have contributed significently for the development of Food Science and Technology.

Nominations

1. The nomination for Fellow should be proposed by five AFST(I) members of good standing for a minimum of 5 years or by 2 Fellows of the Association. This is applicable to AFST(I) members as well as non-members.

2. Any regular or life member of AFST(I), who has been continuously a member of the Association can sponsor the nomination for only one Fellow in a particular year.

3. The nomination shall be accompanied by acceptance of the person proposed.

4. The nomination shall be in the format given. A brief bio- data of the nominee highlighting the Scientific or Technological achievements in the area of Food Science and Technology, supported by a list of publications not exceeding 10 important research papers or other supporting documents not exceeding 20 pages must accompany the nominations.

5. Central Executive Committee Members of AFST(I) are not eligible to be nominated as Fellows.

6. The nomination duly proposed and accepted by the nominee shall be sent to the Hon. Executive Secretary, AFST(I) by **31st March 1996.**

Selection of Fellows

The nominations received will be placed before an Expert Committee appointed by the CEC for suitable recommendations to CEC each year. CEC by majority decision will finalise the names of Fellows for each year. **The decision of CEC in this matter will be final.**

Privileges of a Fellow

The Fellow shall be entitled to the following rights :

1. The awardee will be entitled to add FAFST after his name as short title.

2. To be present and vote at all general body meetings.

3. To propose and recommend the candidates for Fellow of the Association.

4. To receive *gratis* copies of one of the publications of AFST(I).

5. To fill any office of the AFST(I) when duly elected.

6. To be nominated to any committee of AFST(I).

7. To offer papers and communications to be presented before the meeting of the Association.

8. The title will remain for life time of the member.

Cessation of Fellow

1. Any Fellow may withdraw his/her title of the Association by signifying his/her wish to do so by a letter addressed to the Hony. Executive Secretary, AFST(I), which will be placed before the CEC for acceptance.

2. If the Association comes to know of any activity prejudicial to the interest and well being of the Association, the CEC will have the right to withdraw the title.

Conferring as Fellows

The Fellow will be conferred with a Citation at the time of AGBM or at any other suitable function of the Association.

The Association may invite some Fellows nominated each year to deliver special lectures in the area of their specialisation either at the AGBM or any other function arranged by the AFST(I).

Please forward your nominations duly filled as per the format given and mail it by Registered post to the Hony. Executive Secretary, AFST(I), CFTRI Campus, Mysore - 570 013 before **31st March 1996.**

The envelope containing the nomination along with the bio-data and contributions (6 copies) should be superscribed **'Nomination for Fellow AFST(I)'.**

P.C.S. Nambiar
Hon. Executive Secretary

Nomination Form for Fellows of AFST(I)

We, the following members of AFST(I) wish to propose

Full name and academic distinction

FULL NAME

DATE OF BIRTH

AREAS OF SPECIALIZATION

ACADEMIC QUALIFICATIONS

for election as Fellow of AFST(I). We append below the statement of his/her claims for election as Fellow and certify that in our opinion he/she is fully qualified for that distinction. We also certify that he/she has been informed of the obligations attached to the fellows of the AFST(I) and is aggreeable to abide by them, if elected.

Statement of the proposer (not to exceed 100 words) setting out the discovery, invention or other contribution to newer or process/products or the industrial development of the knowledge made by the nominee.

.....

Seconder's name & signature

Date :

Station :

Proposer's name & signature

Date:

Station :

(Signature of supporters from personal/general knowledge)

(1) (2) (3)

I agree for the above nomination

(Name & Signature)

.....

Note :

(1) Six copies of the candidate's bio-data and list of important scientific publications not exceeding 10 pages and one set of reprints or supporting documents not exceeding 20 pages shall be attached to this form.

(2) Additional information that would be of assistance in considering the nomination may be supplied on separate sheet.

(3) Last date for receipt of nomination at the office is **31st March 1996.**

Nominations For AFST (I) Awards for 1995

The AFST(I) has pleasure in inviting nominations for the following awards for the year 1995. All nominations should be sent by registered post, so as to reach Honorary Executive Secretary, Association of Food Scientists and Technologists (India), CFTRI Campus, Mysore - 570 013. before **31st March 1996.**

Prof. V. Subrahmanyan Industrial Achievement Award

The guidelines for the award are :

(i) Only Indian nationals with outstanding achievement in the field of Food Science and Technology will be considered for the award.

(ii) The nominee should have contributed significantly to the enrichment of Food Science and Technology, and the development of agro-based food and allied industries in India.

(iii) The nomination duly proposed by a member of the Association must be accompanied by the bio-data of the candidate, highlighting the work done by him/her for which he/she is to be considered for the award.

(iv) The awardee will be selected by an expert panel constituted by the Central Executive Committee of the Association.

(v) Central Executive Committee Members of AFST(I) are not eligible to apply for the award during their tenure.

The envelope containing the nominations, along with bio-data and contributions (six copies) should be superscribed **'Nomination for Prof. V. Subrahmanyan Industrial Achievement Award - 1995.**

Laljee Godhoo Smarak Nidhi Award

The guidelines for the award are :

(i) The R & D group/person eligible for the award should have contributed significantly in the area of Food Science and Technology in recent years, with a good standing in his/her field of specialization.

(ii) The nominee(s) should be duly sponsored by the Head of the respective Scientific Institution and the application for this award should highlight complete details of the contributions made by the nominees and their significance.

(iii) The nomination duly proposed by a member of the Association must be accompanied by the bio-data of the nominee.

(iv) Central Executive Committee Members of AFST(I) are not eligible to apply for the award during their tenure.

The envelope containing the nominations along with bio-data and contributions (six copies) should be superscribed **'Nomination of Laljee Godhoo Smarak Nidhi Award - 1995".**

Best Student Award

This award is to be given to a student having a distinguished academic record and undergoing the final year course in Food Science and Technology in any recognised University in India. The aim of the award is to recognise the best talent in the field and to encourage excellence amongst the student community.

The guidelines for the award are :

(i) The applicant must be an Indian national

(ii) He/she must be a student of one of the following courses :

(a) M.Sc. (Food Sciences/ Food Technology)

(b) B.Tech., B.Sc., (Tech), B.Sc. (Chem. Tech) with Food Technology specialization.

(iii) He/she should not have completed 25 years of age on 31st December 1995.

Heads of the Department of Food Science and Technology in various Universities may sponsor the name of one student from each institution, supported by the candidate's bio-data, details starting from high school onwards, including date of birth and post-graduate performance to date (six copies).

The envelope containing the nomination should be superscribed **"Nomination for Best Student Award 1995."**

Young Scientist Award

This award is aimed at stimulating distinguished scientific and technological research in the field of Food Science and Technology amongst young scientists in their early life.

The guidelines for the award are :

(i) The candidate should be an Indian national, below the age of 35 years on 31st December 1995, working in the area of Food Science and Technology.

(i) The candidate should furnish evidence of either. ;

(a) Original scientific research of high quality, primarily by way of published research papers and (especially if the papers are under joint authorship) the candidate's own contribution to the work. OR

(b) Technological contributions of a high order, as reflected by accomplishments in process design etc., substantiated with documentary evidence.

The application along with details of contributions and bio-data (six copies) may be sent by registered post with the envelope superscribed **"Nomination for Young Scientist Award 1995".**

Best Paper Award

This award is to be given by the AFST(I) Educational and Publication Trust to the author(s), who have contributed the best paper to the *Journal of Food Science and Technology* published in 1995. A panel of experts, constituted by the Central Executive Committee, will scrutinize the issues and select the best paper for the award.

P.C.S. Nambiar
Hon. Executive Secretary

JFST CONTENTS

JOURNAL OF FOOD SCIENCE AND TECHNOLOGY

Volume 32 Number 6 NOVEMBER/DECEMBER, 1995

AFST(I) EDUCATION AND PUBLICATION TRUST (REGD)

Objectives :

* **To promote the following activities in the areas of Food Science, Food Technology, Food Engineering and Utilization/Treatment of Food Industry By-products/Wastes :**
  * Research and development activities.
  * Improved publication of information.
  * Popularization among students, professionals and general public.
  * Publication of literature and text books.
* **Other major activities in the above specific subject areas are :**
  * To recognize excellence in R & D.
  * To provide adequate publicity and support to training programmes.
  * To arrange seminars, symposia and special lectures by eminent scientists,
  * To institute and award scholarships and fellowships to deserving students.

For Scholarships/Fellowships, Grants, Seed Fund for Book Publication and other particulars, please contact :

Ex-officio Secretary
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Few copies of some of the back-issues of the 'Journal of Food Science and Technology' are available at Discount Rates.

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